UNINTERRUPTIBLE POWER SUPPLY

UPS SLC TWIN RT series
0.7 to 10 kVA

USER'S MANUAL

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1. Introduction.

1.1. Acknowledgement letter.

We would like to thank you in advance for the trust you have placed in us by purchasing this product. Read this instruction manual carefully before starting up the equipment and keep it for any possible future consult that can arise.

We remain at you entire disposal for any further information or any query you should wish to make.

Yours sincerely.

SALICRU

- ❒ The equipment here described **can cause important physical damages due to wrong handling**. This is why, the installation of equipments with power blocks, maintenance and/or fixing of the here described equipment must be done by our staff or **specifically authorised**.
- ❒ According to our policy of constant evolution, **we reserve the right to modify the specifications in part or in whole without forewarning**.
- ❒ All **reproduction or third party concession of this manual is prohibited** without **the previous written authorization** of our firm.

1.2. Using this manual.

The target of this manual or publication is to provide information regarding the safety and to give explanations about the procedures for the installation and operating of the equipment. This manual and rest of support documentation has to be read carefully before installing, location change, setting or any handling of any kind, including the start up and shutdown operation.

Keep this document for future consults.

In the next pages, the "**equipment**" and "**S.T.S.**" terms, are referred to the Uninterruptible Power Supply or UPS and Service and Technical Support respectively.

1.2.1. Conventions and used symbols.

Some or all the symbols of this section can be used and shown in the equipment and/or in the description of this document. It is advisable to be familiar with them and understand their meaning.

- «**Danger of electrical discharge**» symbol. Pay special attention to it, both in the indication on the equipment and in the paragraph referred to this user's manual, because it contents features and basic informations for person safety. To not respect these indications can result in serious incidents or even the death due to electrical discharges
- «**Warning**» symbol. Carefully read the indicated paragraph and take the stated prevention measures, so it contents basic safety instructions for persons. To not respect such instructions can cause serious incidents. Those indications with "CAUTION " symbol content features and basic instructions for safety of the things. To not respect such instructions can damage the goods.
- «**Precaution**» symbol. Read the paragraph text and take the stated preventive mediums, it contents the basic instructions and features for the equipment safety. To not respect these indications can create material damages on the own equipment, installation or loads.
- «**Notes of information**» symbol. Additional topics that complement the basic procedures. These instructions are important for the equipment use and its optimum efficiency.
- «**Main protective earthing terminal**» symbol. Connect the earth cable coming from the installation to this terminal.
- «**Earth bonding terminal**». Connect the earth cable coming from the load and the external battery cabinet to this terminal.
- **Preservation of the environment**: The presence of this symbol in the product or in their associated documentation states that, when its useful life is expired, it will not be disposed together with the domestic residuals. In order to avoid possible damages to the environment, separate this product from other residuals and recycle it suitably. The users can contact with their provider or with the pertinent local authorities to be informed on how and where they can take the product to be recycled and/or disposed correctly.
- Alternating Current A.C..
- Direct Current D.C..
- Recycle.

1.2.2. For more information and/or help.

For more information and/or help of your specific unit, contact with our Service and Technical Support (**S.T.S.**).

1.2.3. Safety instructions.

- Check the data of the nameplate are the required by the installation.
- Never forget that the **UPS is a generator of electrical energy**, therefore the **user has to take precautions about against direct and indirect contacts**.

  Its energy source, a part from the AC mains, lies on the batteries, usually included in the same case or cabinet that the equipment electronics. However, some models and/or extended back up times, batteries can be supplied in a separate case or cabinet.

  If the batteries are connected to the equipment and their protections are switched "On", whenever they are, it is irrelevant if the UPS is or not connected to mains, as well as the status of the mains protection. The outlets or output power blocks will supply voltage meanwhile the battery set has energy.
- **Compliance as regards to "Safety instructions" is mandatory, being the user the legal responsible regarding** to its observance and application. Read them carefully and follow the stated steps in the established order, keep them for future consults that may arise.
- If **the instructions are not in total or partial and in special referred to the safety, do not carry on with the in-**

stallation or commissioning tasks, because there could be a **risk on your safety or on the other/s persons,** being able to make **serious injuries even the death**, also it can **cause damages to the equipment and/or to the loads and installation**.

- The local electrical regulations and the different restrictions of the client's site, they can invalidate some recommendations included in the manuals. When discrepancies exist, the user has to comply the local regulations.
- The equipments provided with power cord with plug and outlets, can be connected and used by personnel without any kind of experience.

  The equipments with power blocks have **to be installed by qualified personnel** and it can be used by personnel with not specific training, just with only help of this manual.

  A person is defined as **qualified**, if it has experience of assembling, commissioning and perfect control operating of the equipment, if he has the requirements to do the job and if has read and understand all the things described in this manual, in particular the safety indications. Such preparation is considered only valid if it is certified by our **S.T.S.**.
- Place the equipment the closest to the power supply and loads to be supplied, leaving an easy access if it were needed an urgent disconnection.

  In the hardwired equipments and due to the impossibility of fast disconnection, a disconnection device (switch) with easy access and close to the equipment will be installed.
- Warning labels should be placed on all primary power switches installed in places away from the equipment to alert the electrical maintenance personnel of the presence of a UPS in the circuit

  The label will bear the following text or an equivalent one:

> **Before working in this circuit.**
>
> - Isolate the Uninterruptible Power System (UPS).
> - Check the voltage between all terminals including the protective earth.
>
> **Risk of voltage feedback from UPS.**

1.2.3.1. General safety warnings.

- All connections and disconnections of the cables from the equipment, including the control ones, will be done with no power supply and the switches on rest, position «O» or «Off».
- Shutdown the equipment completely by switching «Off» the button of the control panel first. Next disconnect the cable from the wall outlet for standard equipments up to 3 kVA or by switching «Off» the input circuit breaker and disconnect the power supply cables in models 3kVA (B1) or higher power rate.

  The indiscriminate manoeuvring of the switches may involve production losses and/or equipment damages. Consult the documentation before doing any action
- Pay special attention to the labelling of the equipment that warns about the «Electrical shock hazard». Inside the equipment there are dangerous voltages, never open the enclosure, the access has to be done by qualified staff. In case of maintenance or fault, consult to the closest (**S.T.S.**).
- Cross cable sections used to supply the equipment and loads, will be according to the nominal current stated in the nameplate label of the equipment, and respecting the Low Voltage Electrotechnical Regulations or standards of the country.

  Use approved cables only
- Protection Earth cable of the UPS drives the leakage current of the load devices. An isolated earth cable has to be installed as part of the circuit that supplies the equipment. Cross cable section and its features will be same as the power supply cables, but with green colour with or without the yellow strip.

  All outlets of the UPS has an earth bonding, duly connected and those equipments with power blocks there is an exclusive terminal for the load earth connection. When an outgoing distribution is done, i.e power strips, it is essential that they have an earth terminal connected to each one of them.

  It is essential that the cables that supplies the loads have the earth connection cable.

  The protection earth must be connected to the frame or metallic chassis of any electrical equipment (in our case to the UPS, battery cabinet or case and loads), assuring that it is done before connecting the input voltage.

  Check the quality and availability of the earth, it has to be between the defined parameters by the local or national regulations.
- In small equipments (the ones connected with the foreseen power cord with plug), the user has to check the wall outlet corresponds with the type of supplied plug, with earth duly installed and connected to the local protection earth.
- During the normal UPS operation, in equipments up to 3kVA the power cord cable can't be disconnected from wall outlet, because the protection earth of the own UPS would be disconnected and also the earth from the loads connected to the output.

  For this reason, the general protection earth cable of the building or switchgear panel that supplies the UPS will not be disconnected.
- In small UPS (the ones connected with the foreseen power cord with plug), check that the sum of the leakage currents of the UPS and connected load/s do not exceed over 3,5mA.
- The installation will have input protections sized to the currents of the equipment and stated in the nameplate label (RCD devices type B and circuit breakers with C characteristic or any other equivalent one).

  Overload conditions are considered as a nonpermanent an exceptional operating mode, so these currents will not be kept in mind when sizing the protections.
- Do not overload the UPS by connecting loads with inrush consumptions at its output, like laser printers.
- For those installations with redundant equipments or separate Bypass line, there will only be a common RCD of 300 to 500 mA at the head of the installation for both lines.
- Output protection will be done with a circuit breaker of C characteristic or an equivalent one.

  It is recommended to distribute the output power, into four lines as minimum. Each one of them will have a protection circuit breaker sized to the quarter of the nominal power. This kind of outgoing distributions will allow that any fault in any device connected to the equipment, that makes a short-circuit, will affect to the line with the faulty device only. An uninterruptible power supply will be guaranteed to the rest of connected loads, due to the protection tripping of the affected line by the short-circuit only.
- When replacing a fuse, do it for another of the same type, characteristics format and size.
- Under any concept the input power cord will be connected to the output of the equipment, either directly or through other ways.
- Models with separate bypass line, a galvanic isolation transformer has to be installed in any of the two lines that supply the UPS (rectifier input or static bypass), to avoid the direct union of the neutral of both lines through the internal wiring of the equipment.

This is applicable when the two lines are supplied from different mains, i.e.:

- ❒ Two different electrical companies.
- ❒ An electrical company and genset, ...

- All the equipments have an auxiliary terminal strip to install an external emergency power off button (EPO), and it will belong to the user property.

  Type of circuit is selectable through the LCD panel of the equipment. The contact is preset from factory as normally open, so the button must be switched to close the circuit and the voltage to the loads is broken. To establish the power supply to the loads again, the EPO button must be deactivated.

  EPO doesn't affect to the power supply of the equipment, it only breaks the power supply to the loads as a safety measure.

- When supplying input voltage to a UPS with fitted in or separate static bypass, although the inverter is still turned «Off» (deactivated) it doesn't mean that at the output there will not be voltage.

  So, to do it, the input and static bypass switches will have to be turned «Off».

  Put warnings of danger and/or emergency switches if the safety Standards require it in your particular installation.

- It is possible that the UPS supplies output voltage through the manual bypass to those equipments that incorporate it either standard or optional, so it will have to be considered as regards to safety. If it were necessary to break the output supply of the equipment in this situation, deactivate the outgoing distribution protection or in case of lack of it the general protection of the distribution panel that feeds the UPS.
- All power supply electrical cables have to be fixed to the equipments and loads, interfaces, etc..., to unmovable parts and in the way to avoid treads, trips on them or fortuitous pulls.
- Phase equipments in the foreseen terminal for that purpose.
- CHASSIS or RACK mounted equipments are destined to be installed in a predetermined set to be done by professionals.
  - ❒ The installation has to be designed and executed by qualified personnel, who will be the responsible to apply the safety and EMC regulations and standards that controls the particular installations where the product is destined.
  - ❒ The equipments assembled in CHASSIS do not have enclosure protection, even the power blocks are unprotected.
  - ❒ Some RACK mounted equipments do not have the power blocks protected.
- Never manipulate the equipment with wet hands.

1.2.3.2. To keep in mind.

- Do not try to dismantle or change any part of the equipment, if this action is not contemplated in this document. Manipulation inside the UPS due to any modification, reparation or any other cause, can make an electrical discharge of high voltage and it is restricted to **qualified** staff only. Do not open the equipment.

  A part from the implicit stated risks, any action that make the modification, internal or external of the equipment or just only the simple intervention inside of itself, which is not stated in this document, **it can expire the warranty**.

- If it is observed that the UPS exhausts smoke or toxic gas, shutdown it immediately and disconnect it from the power supply. This kind of fault can cause fire or electrical discharge. Contact with our **(S.T.S.)**.
- In case of an accidental equipment dropping or if the enclosure is damaged, do not start it up under any concept. This kind of fault can cause fire or electrical discharge. Contact with our **(S.T.S.)**.
- Do not cut, manipulate the electrical cables, do not put heavy objects over them too. Any of these actions could cause a short-circuit and make a fire or electrical discharge.

  Check that the electrical cables of connection, plugs and outlets are in good conditions.

- When moving an equipment from a cold place to a warm environment and vice versa, it can cause condensation (small water drops) in the external and internal surfaces. Before installing a moved equipment from another place or even packaged, the equipment will be left for a minimum time of two hours in the new location before making any action, with the purpose of adapting it to the new environmental conditions and avoid the possible condensations.

  The UPS has to be completely dry before starting any installation task.

- Do not store, install or expose the equipment in corrosive, wets, dusty inflammable or explosive environments and never outdoors.
- Avoid to locate, install or store the equipment in a place with direct sunlight or high temperatures. Batteries could be damaged.

  In the exceptional case and long exposition to intense heat, batteries can cause filtrations, overheating or explosions, which can cause fires, burn or other injuries. High temperatures can also make deformation in the plastic enclosure.

- The location will be spacious, airy, away from heat sources and easy access.
- Do not obstruct the cooling grids by entering objects through themselves or other orifices.
- In equipments of low power rate (up to 3kVA), leave as minimum space of 25 cm in the equipment peripheral and 50 cm for higher power rates equipments.
- Also in the UPS with power blocks, it is recommended to leave another additional 50 cm for an eventual intervention of the (**S.T.S.**), considering that if it means to move the UPS, the connected cables will have the needed clearance.
- Do not put materials over the equipment or parts that obstruct the correct visualization of the synoptic.
- Be careful to not wet it, because it is not waterproof. Do not allow entering any kind of liquids in. If accidentally the outside of the machine comes into contact with liquids or salt air, dry it with a soft and absorbent cloth.
- To clean the equipment, wipe over a damp cloth and then dry it. Avoid sprinkling or spillage that could enter through the slots or cooling grids, which may cause fire or electric shock.

  Do not clean the equipments with products that could have alcohol, benzene, solvent or other inflammable substances, or they are abrasive, corrosive, liquids or detergent.

- When it is needed to remove the protection cover to access to the terminals, they will have to be put back before starting up the equipment. Otherwise you may incur personal injury or equipment damage.
- Be careful to not lift heavy loads without help, according to the following recommendations:
  - ❒ 🧍 , < 18 kg.
  - ❒ 🧍🧍 , 18 - 32 kg.

- ❒ , 32 - 55 kg.
- ❒ , > 55 kg.

- UPSs are electronic equipments, so they will be treated as they are:
  - ❒ Avoid shocks.
  - ❒ Avoid jolting or bouncing of the UPS, like those produced by moving the equipment on a hand truck and move on an uneven or wavy surface.
- UPS transport will be done packaged inside its original packaging in order to prevent it from shock and impact and by means of the suitable type of packaging (carton box, pallet packaging, ...) and appropriate to its weight.
- Although the physical location of the elements can differ from the illustrations in this manual in some cases, the correct labelling correct the possible doubts and makes easy its comprehension.

1.2.3.3. Safety warning regarding batteries.

- The manipulation and connection of the batteries shall be done and supervised by **personnel with battery knowledge only**.

  Before doing any action, disconnect the batteries. Check that no current is present and there is not dangerous voltage in the DC BUS (capacitors) or in the endpoint of the battery set terminals.

  Battery circuit is not isolated from input voltage. Dangerous voltages can be found between the terminals of the battery set and the earth. Check that there is not any voltage at the input before take any action over them.
- When faulty batteries are replaced, the complete battery set has to be replaced, less exceptional cases in new equipments, were due to manufacturing faults it will only be replaced the defective ones.

  The replacement will be done by another one of the same type, voltage, capacity, quantity and brand. All of them has to be of the same brand.
- Generally, the used batteries are sealed lead acid of 12V and maintenance free (VRLA).
- Do not reuse the faulty batteries. There could be an explosion or burst any battery with the involved problems and issues that could happen.
- Generally supplied batteries are installed in the same cabinet, case or rack of the equipment. Depending on the power, autonomy or both, they can be supplied separately from the equipment in another cabinet, case or rack, with the interlink cables among them. Do not modify its length.
- In those equipments requested without batteries, their acquisition, installation and connection of themselves will be done by the end-user and **under his responsibility**. Data concerning the batteries as regards to quantity, capacity and voltage, are stated in this battery label sticked beside the nameplate of the equipment. **Respect these data**, battery connection polarity and the supplied circuit diagram **strictly**.

  For an optimum and efficient operating, the battery set has to be located as close as possible to the equipment.
- The battery voltage can involve the risk of electric shock and can produce high short circuit currents. Observe the following preventive measures before manipulating any terminal block identified in the labelling as «Batteries»:
  - ❒ Disconnect the corresponding protection elements.
  - ❒ When connecting a battery cabinet to the equipment, respect the cable's polarity and colour (red-positive; black-negative) indicated in the manual and in the corresponding labelling.
  - ❒ Wear rubber gloves and shoes.
  - ❒ Use tools with insulated handles.
  - ❒ Take off watches, rings or other metal objects.
  - ❒ Do not place metal tools or objects over the batteries.
  - ❒ Never manipulate with your hands or through conducting objects, do not short either the battery terminal block of the equipment or the own from the batteries.
- In order to avoid a complete discharge of the batteries and as a safety measure after a long blackout of the commercial mains and when ending the working day, proceed to the load shutdown and then to the equipment too, by following the operating described in this «User's manual».
- When the equipment and/or battery module has a protection through a fuse and it were needed to be replaced, it will always be done by another one with the same dimension, type and size.
- For long periods of disconnection, consider that the equipment has to be connected once a month for 10 hours as minimum, in order to charge the batteries, so the irreversible degradation of itself is avoided. On the other hand, in case of storing an equipment, it will be done in a fresh and dry place, **never outdoors**.
- Never short the battery terminals as it involves a high risk. It involves the detriment of the equipment and batteries.
- Avoid mechanical efforts and impacts.
- Do not open or mutilate the battery. Spilled electrolyte is harmful and toxic to the skin and eyes.
- Do not dispose the batteries in a fire and high temperatures. The batteries may explode.
- In case of contact of the acid with parts of the body, wash immediately with plenty water and call urgently the nearest medical service.
- Batteries involve a serious risk for the health and for the environment. Their disposal should be done according to the existing laws.

2. Quality and standard guarantee.

2.1. Declaration of the management.

Our target is the client's satisfaction, therefore this Management has decided to establish a Quality and Environmental policy, by means of installation a Quality and Environmental Management System that becomes us capable to comply the requirements demanded by the standard **ISO 9001** and **ISO 14001** and by our Clients and concerned parts too.

Likewise, the enterprise Management is committed with the development and improvement of the Quality and Environmental Management System, through:

- The communication to all the company about the importance of satisfaction both in the client's requirements and in the legal and regulations.
- The Quality and Environmental Policy diffusion and the fixation of the Quality and Environment targets.
- To carry out revisions by the Management.
- To provide the needed resources.

2.2. Standard.

The **SLC TWIN RT** product is designed, manufactured and commercialized in accordance with the standard **EN ISO 9001** of Quality Management Systems. The CE marking shows the conformity to the EEC Directive by means of the application of the following standards:

- **2006/95/EC** Low voltage directive.
- **2004/108/EC** Electromagnetic Compatibility directive (EMC).

In accordance with the specifications of the harmonized standards. Standards as reference:

- **EN-IEC 62040-1**. Uninterruptible power supply (UPS). Part 1-1: General and safety requirements for UPS's used in accessible areas by end users..
- **EN-IEC 60950-1**. IT equipments. Safety. Part 1: General requirements.
- **EN-IEC 62040-2**. Uninterruptible power supply (UPS). Part 2: EMC requirements.

The manufacturers responsibility is excluded in the event of any modification or intervention in the product by the customer's side.

This is a product for its use in commercial and industrial applications, so restrictions and additional measures can be needed in the installation to prevent perturbations.

Declaration of conformity CE of the product is at the client disposal under previous request to our headquarters offices.

2.3. Environment.

This product has been designed to respect the environment and has been manufactured in accordance with the standard **ISO 14001**.

Equipment recycling at the end of its useful life:

Our company commits to use the services of authorised societies and according to the regulations, in order to treat the recovered product at the end of its useful life (contact your distributor).

Packaging:

To recycle the packing, follow the legal regulations in force.

Batteries:

The batteries mean a serious danger for health and environment. The disposal of them must be done in accordance with the standards in force.

3. Presentation.

3.1. Views.

3.1.1. Views of the equipment.

Figures from 1 to 3 are shown the illustrations of the equipment depending on the format of the case and regarding the power rate of the model. Nevertheless and due to the product is in constant evolution, some small discrepancies or contradiction can arise. In case of doubt, the labelling of the own equipment will always prevail.

In the nameplate sticked in the equipment, all the data referred to the main features of the equipment can be checked. Act in accordance with the installation.

3.1.2. Legends corresponding to the equipments views.

Symbols and their meaning			
Symbol	**Meaning**	**Symbol**	**Meaning**
	Warning		Earth
	Risk of discharge		Alarm silenced
	UPS ON / Battery test		Overload
	UPS OFF		Battery
	UPS on Standby or shutdown		Recycling
	Alternating (AC)		Keep the UPS in a cooled place
	Direct (DC)		

Tabla 1. Used symbology in the equipment and/or this manual.

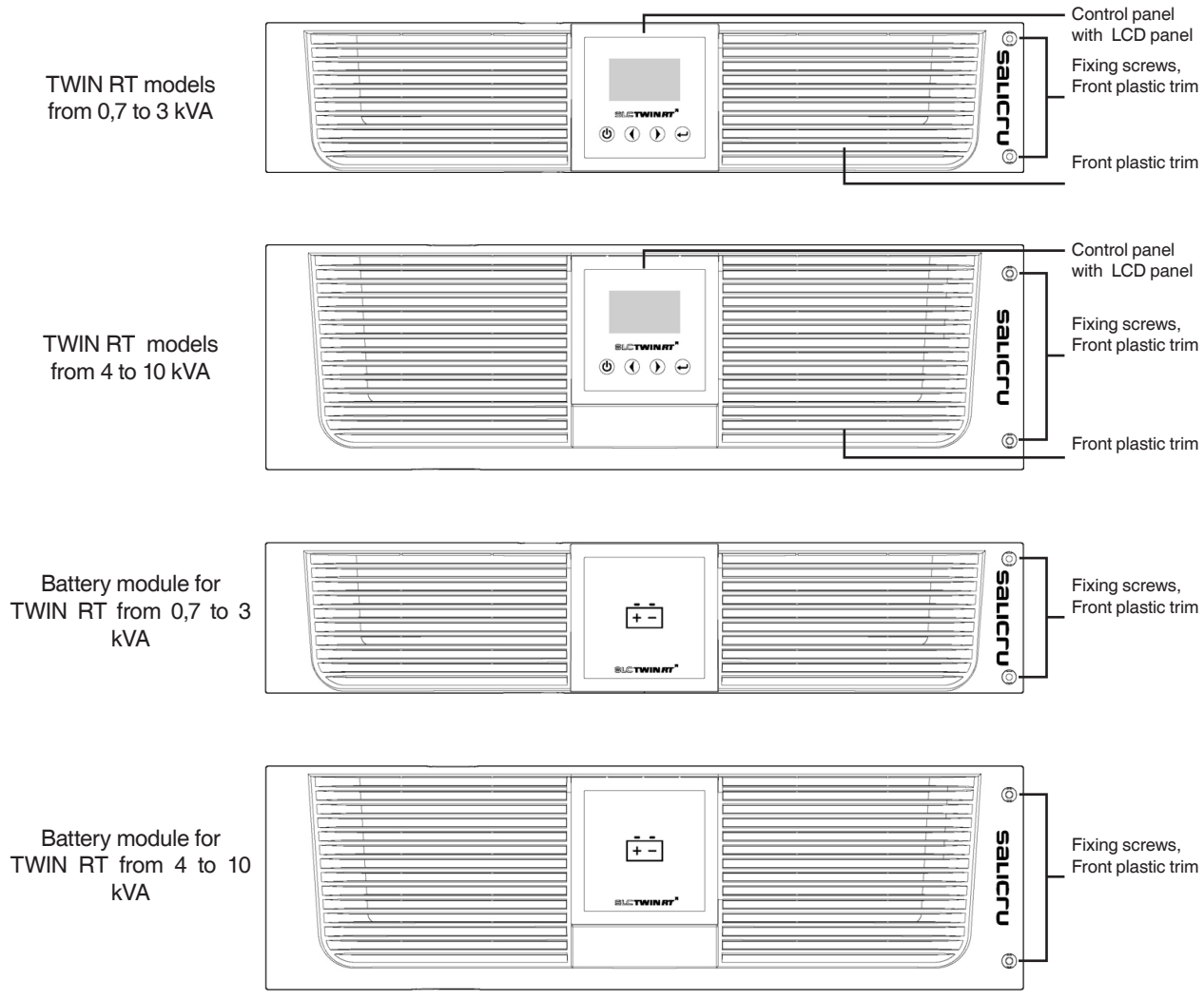
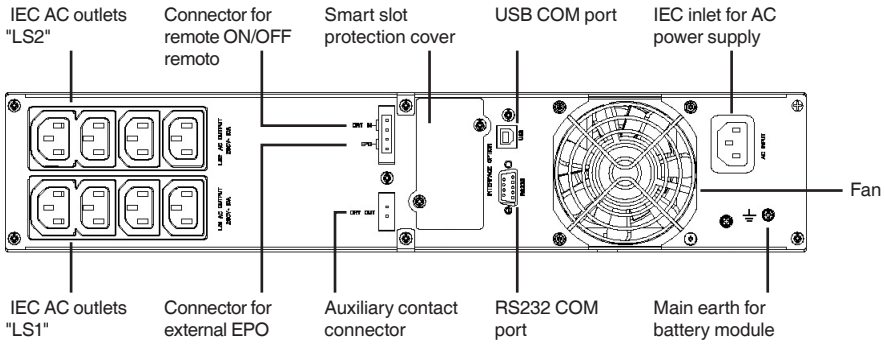
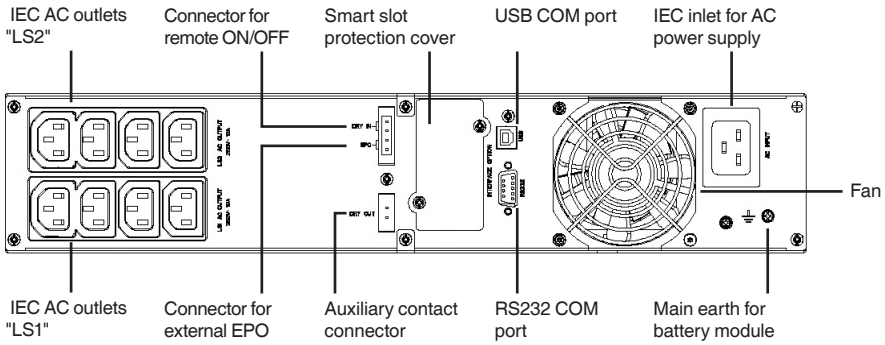

TWIN RT models from 0,7 to 3 kVA
Control panel with LCD panel
Fixing screws, Front plastic trim
Front plastic trim
TWIN RT models from 4 to 10 kVA
Control panel with LCD panel
Fixing screws, Front plastic trim
Front plastic trim
Battery module for TWIN RT from 0,7 to 3 kVA
Fixing screws, Front plastic trim
Battery module for TWIN RT from 4 to 10 kVA
Fixing screws, Front plastic trim
salicru

Fig. 1. Front view of models from 0,7 to 10 kVA and battery modules for extended back up times.

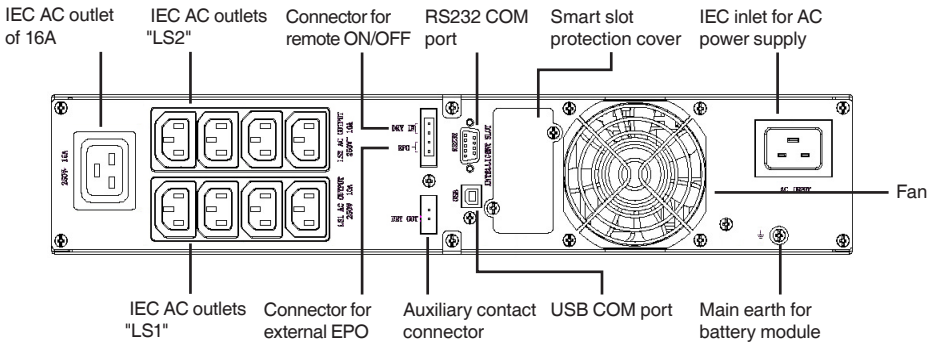
Models from 0,7 to 2 kVA standard and from 0,7 to 1,5 kVA (B1)



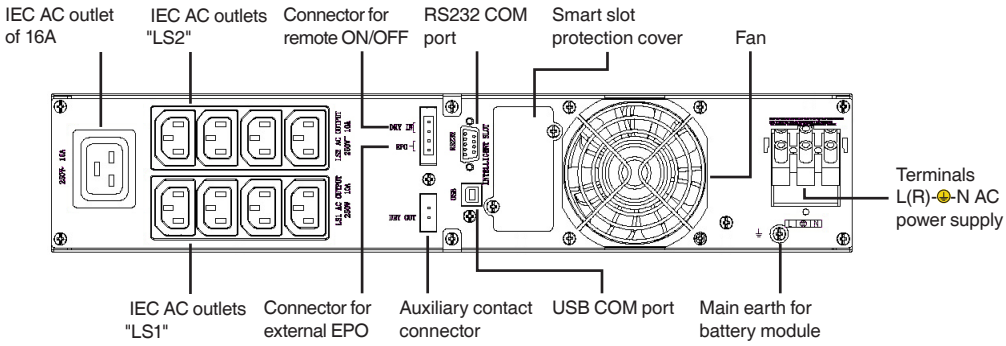
Models of 2 kVA (B1)



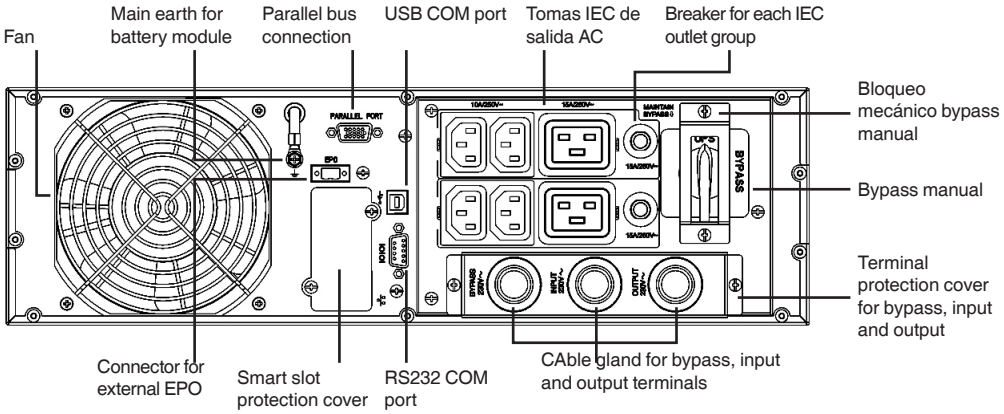
Models of 3 kVA standard



Models of 3 kVA (B1)



Models from 4 to 6 kVA standard


Fan
Main earth for battery module
Parallel bus connection
USB COM port
Tomas IEC de salida AC
Breaker for each IEC outlet group
Bloqueo mecánico bypass manual
Bypass manual
Terminal protection cover for bypass, input and output
CAble gland for bypass, input and output terminals
Connector for external EPO
Smart slot protection cover
RS232 COM port

Models from 8 to 10 kVA
estándar

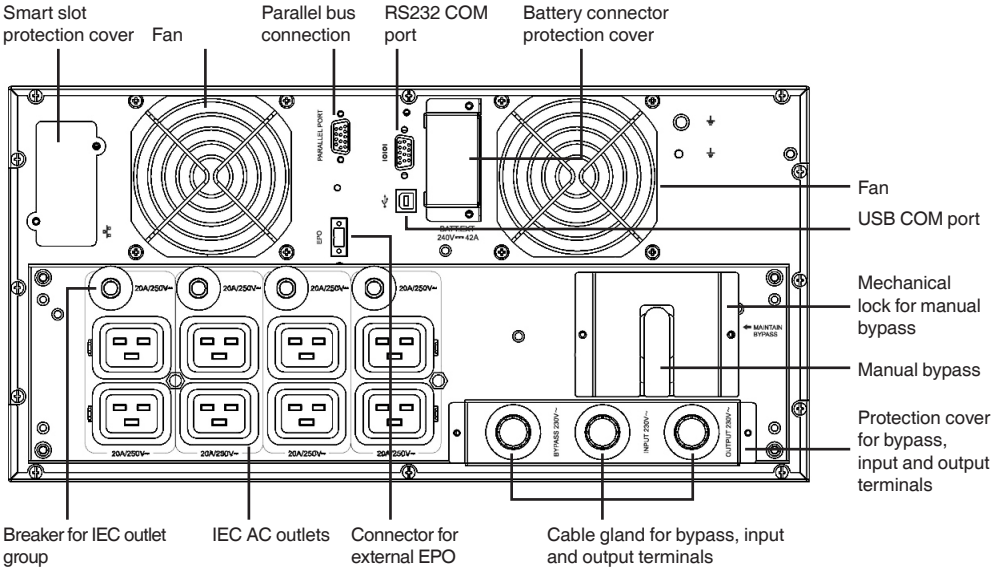
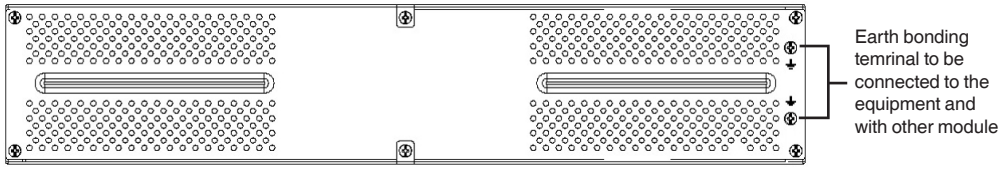
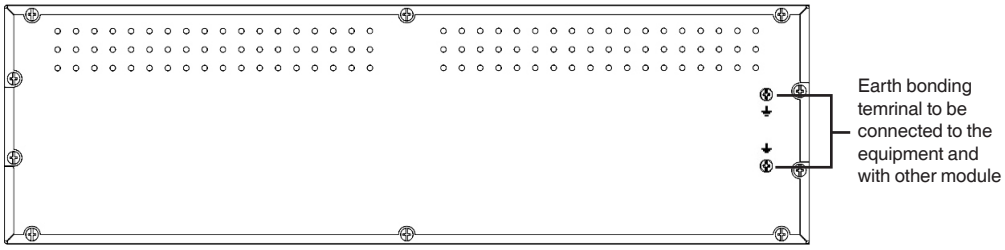


Fig. 2. Rear view models from 0,7 to 10 kVA.

Battery module for equipments
from 0,7 to 3 kVA



Battery module for equipments
from4 to 6 kVA



The connection of the battery module with the equipment and/or with other module is done from the front panel in equipments up to 6kVA. To do it, it will be needed to remove the front plastic trim of all the racks, to have access to the connection connectors ready for this purpose.

Battery module for equipments
from 8 to 10 kVA

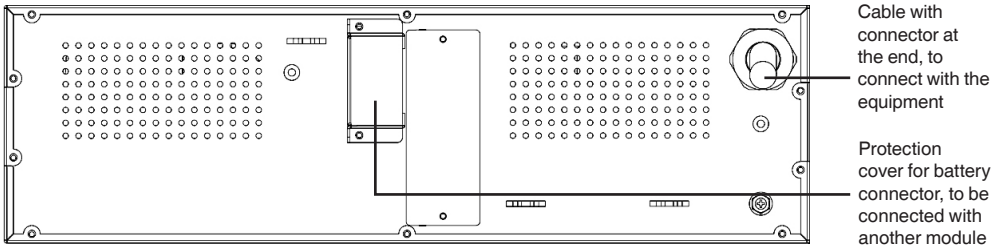
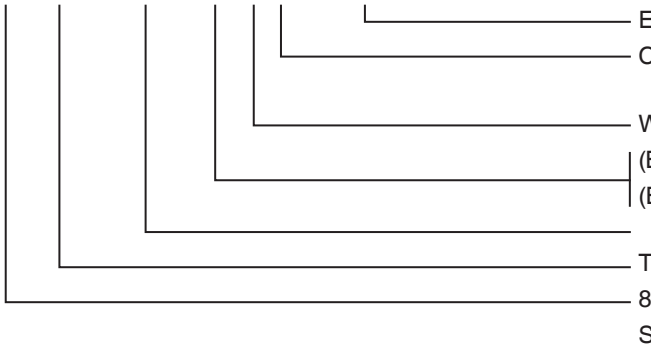

Cable with connector at the end, to connect with the equipment
Protection cover for battery connector, to be connected with another module

Fig. 3. Rear view of the battery modules for extended back up times.

3.2. Definition of the product.

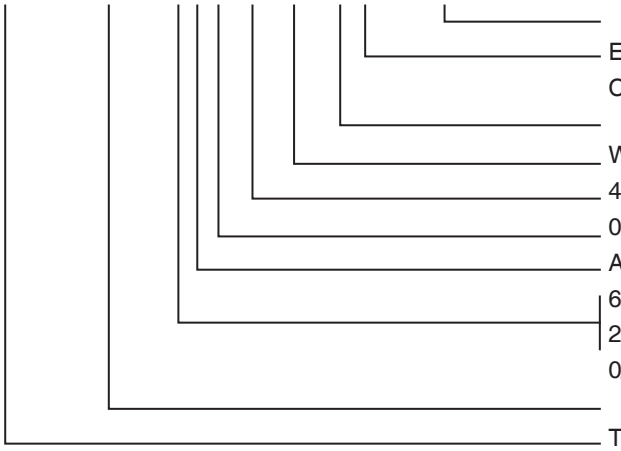
3.2.1. Nomenclature.

SLC-8000-TWIN RT (B1) WCO “EE29503”



EE*	Special specifications of the client.
CO	“Made in Spain” marking in the UPS and packaging (custom issues).
W	Neutral brand.
(B0)	No batteries and no space to fit them in.
(B1)	Equipment with extra charger and batteries out from UPS.
TWIN RT	Series of the equipment.
8000	Power in VA.
SLC	Brand acronym.

MOD BAT TWIN RT 2x6AB003 40A WCO “EE29503”



EE*	Special specifications of the client.
CO	“Made in Spain” marking in the UPS and packaging (custom issues)..
W	Neutral brand.
40A	Protection size.
003	Last three characters of battery code.
AB	Initials of the battery family.
6	Battery quantity in one string.
2x	Quantity of strings in parallel. Omitted for one.
0/	Battery module without them, but the needed accessories to install them.
TWIN RT	Series of the battery module.

MOD BAT Battery module.

Note relative to the batteries:

B0 and B1 acronyms stated the nomenclature related to batteries:

(B0) The equipment is supplied without batteries and without accessories for them (screws and electrical cables).

Batteries are property of the client, and they will be fitted out of the UPS case or cabinet.

Under request, it is possible to supply the accessories (screws and electrical cables), needed to install and connect the external batteries.

(B1) Equipment with extra battery charger. The equipment is supplied without batteries and without accessories for them (screws and electrical cables), corresponding to the stated batteries in the model.

Under request, it is possible to supply the accessories (screws and electrical cables), needed to install and connect the batteries.

For those equipments requested without batteries, the acquisition, installation and connection of themselves will always be done by client and under his responsibility.

Regarding the battery data of quantity, capacity and voltage stated in the nameplate sticked of the equipment, **respect this data and the polarity of the battery connection strictly** .

In equipments with separate bypass line, a galvanic isolation transformer has to be installed in any of both UPS input power supplies (rectifier input or static bypass), in order to avoid the direct connection of both lines through the internal wiring of the equipment.

This is only applicable,when both power supply lines come from different electrical networks, for example:

- Two different electrical companies.

- One from an electrical company and the other from a generator set, ...

3.3. Operating principle.

This manual describes the installation and operating of the Uninterruptible Power Supply (UPS) from **SLC TWIN RT series**, as equipments that can work as a single units or connected in parallel with a maximum of two units (equipments higher than 3 kVA only).

UPS from **SLC TWIN RT** series assures a maximum protection of any critical load, keeping the power supply voltage to the loads between the stated parameters, with no break, when a failure, fluctuation or deterioration happen in the electrical commercial mains and with wide range of available models (from 0,7 kVA to 10 kVA) and allow adapting the model to the end-user needs.

Thanks to the used technology, PWM (pulse width modulation) and the double conversion, the UPSs from **SLC TWIN RT** series are compact, cold, silent and with high efficiency.

The double converter principle cancels any perturbation of the energy mains fluctuations. A rectifier converts the AC alternating current from mains into DC direct current, which keeps both the optimal battery charge level and supplies the inverter that at the same time generates a sinewave AC alternating voltage ready to supply the loads permanently. In case of input mains power supply fault, the batteries supply clean energy to the inverter.

The design and UPS construction from **SLC TWIN RT** series have been done in accordance with the international standards.

In models up to 3 kVA, there are available IEC outlets associated to configure groups by means of the control -LS1 and LS2-. At higher power models available automatic protections per each outlet group and also they have terminals to make the corresponding power connection.

The complete series has connectors for USB and RS232 ports and EPO too for an external installation by the end-user of a an emergency button, as an option. In the models from 0,7 to 3 kVA it is supplied a dry contact to install a remote start up and shutdown of the equipment (Dry-in), as well as an auxiliary contact as an alarm (Dry-out).

As an option, inside the smart slot, one of the following communication cards can be inserted: AS-400 interface, SNMP for controlling the equipment via Web or card for Internet or Intranet managing.

Models from 4 to 10 kVA, allow the parallel connection of a second equipment of the same features for a redundant configuration or to increase the available power. This connection can be done at any time and it does not condition the acquisition of itself. Likewise, this power range has manual bypass.

It is possible to increase the standard back up time of the equipment by connecting additional battery modules. In order to optimise the recharging time of the batteries, there are equipments that incorporate battery chargers with higher quality performances (B1). This option (B1) is not available for power rates higher than 3 kVA.

The flexibility of this series to manage a wide range of IT devices, it makes the best option to protect your LAN, servers, workstations and other electrical devices, and to ensure that your business is protected against fluctuations of voltage, frequency, electrical noises, blackouts and mains faults, which are present in the energy distribution lines.

This manual is applicable to the standardised models stated in table 2.

3.3.1. Main features.

- True on-line with double conversion technology and output frequency independent from mains.
- Output power factor 0,9 and pure sinewave, suitable for almost any kind of loads.
- Input power factor > 0,99 and high general efficiency (between 0,87 and 0,9 for models 0,7 to 3 kVA and > 0,93 for higher power rates). It is obtained both a higher energy saving and lower cost of installation to the end-user (wiring), as well as low input current distortion, therefore the pollution in the power supply is minimised.
- High adaptability to the worst conditions of the input mains. Wide input voltage range, frequency range and wave shape, so it is avoided the excessive dependence of the limited energy of the battery.
- Availability of the extended back up times, by adding additional battery modules.
- Possibility to connect two equipments in parallel (models with power rate higher than 3 kVA only).
- High efficiency mode > 0,95 selectable (ECO-MODE). Energy saving, which revert to the user in an economic way.
- Possibility to start up the equipment without mains or battery discharged. Be careful with the last aspect, because the back up time will be decreased as much they are discharged.
- The technology of smart battery management is very useful to extend the battery lifetime and to optimise the recharging time.
- Standard communication options through RS-232 or USB ports.
- Remote emergency power off control (EPO).
- Control signal of remote emergency power off (EPO).
- Interface between user and equipment through the control panel LCD screen and led indicators, friendly use.
- Available option connectivity cards to improve the communication capacity.
- Firmware updating in an easy way, without needing the Service and Technical Support (**S.T.S.**).
- Simplified maintenance, which allows replacing the batteries in a secure way without shutdown the UPS.
- Installation of the rack or tower equipment, with adaptable control panel (horizontal or vertical) to the required installation mode.

Model	Type	Input / output tipology
SLC-700-TWIN RT	Standard	Single phase / Single phase
SLC-1000-TWIN RT		
SLC-1500-TWIN RT		
SLC-2000-TWIN RT		
SLC-3000-TWIN RT		
SLC-4000-TWIN RT		
SLC-5000-TWIN RT		
SLC-6000-TWIN RT		
SLC-8000-TWIN RT		
SLC-10000-TWIN RT		
SLC-700-TWIN RT (B0)	No batteries	Single phase / Single phase
SLC-1000-TWIN RT (B0)		
SLC-1500-TWIN RT (B0)		
SLC-2000-TWIN RT (B0)		
SLC-3000-TWIN RT (B0)		
SLC-4000-TWIN RT (B0)		
SLC-5000-TWIN RT (B0)		
SLC-6000-TWIN RT (B0)		
SLC-8000-TWIN RT (B0)		
SLC-10000-TWIN RT (B0)		
SLC-700-TWIN RT (B1)	Large back-up time with additional charger	Single phase / Single phase
SLC-1000-TWIN RT (B1)		
SLC-1500-TWIN RT (B1)		
SLC-2000-TWIN RT (B1)		
SLC-3000-TWIN RT (B1)		

Tabla 2. Standardized models.

3.4. Options.

Depending on the selected configuration, the equipment can include any of the following options:

3.4.1. Isolation transformer.

The isolation transformer, provides a galvanic isolation that allows isolating the output from the input completely.

The installation of an electrostatic shield between the primary and secondary windings of the transformer provides a high level of attenuation of the electrical noises.

The isolation transformer can be installed at the input or output of the UPS from **SLC TWIN RT** series and it will always be located out from the equipment enclosure.

3.4.2. External maintenance manual bypass.

The purpose of this option is to isolate electrically the equipment from mains and critical loads, without breaking the power supply to the loads. Therefore, in this way the maintenance or fixing tasks can be done in the equipment with no interruption on the power supply energy to the protected system, at the same time that unnecessary risks are avoided to the technical staff.

The basic difference between this option and the manual bypass integrated in the own UPS enclosure in models of higher power rate than 3 kVA, consists in a better manoeuvring, because it allows a complete disconnection of the UPS from the installation

3.4.3. Integration in IT networks by means of the SNMP adaptor.

The big IT systems based on LANs and WANs that integrate servers with different platforms, they have to include an easy way of controlling and management at the manager system disposal. This facility is got through the SNMP adaptor, which is well-known by the main software and hardware manufacturers

The available SNMP option for SLC **TWIN RT** series is a card to be inserted into the slot that the UPS has in its rear side.

The connection of the UPS with the SNMP is internal meanwhile the connection between the SNMP and the IT network is done through a RJ45 connector 10 base.

3.4.4. Relays interface card.

See section 4.3.10.3.

3.4.5. Parallel cable kit.

The parallel cable kit is used to make the parallel communication control between two equipments of the same power rate that makes a system.

3.4.6. MODBUS protocol.

The big IT systems based on LANs and WANs, many times they require that the communication with any device to be integrated in the IT network has to be done by means of an industrial standard protocol.

One of the most used industrial standard protocols in the market is the MODBUS protocol. **SLC TWIN RT** series is also ready to be integrated in this type of environments through the external “SNMP TH card” device with MODBUS protocol.

3.4.7. Telescopic guide kit for rack cabinet assembling in.

There is available only one model of telescopic guide kit for all models, suitable for any type of rack cabinet.

These guides allow installing any unit of the TWIN RT equipment and their possible battery modules, in case of extended back up times, as it was a rack with its respective cabinet.

4. Installation.

- Check the Safety instructions, from section 1.2.3.
- Check that the data in the nameplate are the required by the installation.
- A wrong connection or manoeuvring, can make faults in the UPS and/or loads connected to itself. Read carefully the instructions of this manual and follow the stated steps in the established order.
- The equipments can be installed and used by personnel with no specific training just with the help of this «Manual» only, less those ones that are hardwired, which have to be installed by qualified personnel.
- All connections of the equipment including the control (interface, remote panel, ...), will be done with the switches at rest and no voltage present (UPS power supply switch to «Off»).
- Never forget that the UPS is an electrical energy generator, so the user has to take the needed cautions against direct and indirect contacts.
- When there is only one equipment, omit all the instructions of this document and their implicit connections as regards to parallel systems.
- Parallel system installation needs a switchgear panel with separate input, output and static bypass protections, and a manual bypass too.

  This switchgear panel allows isolating only one equipment from the system, when facing any malfunctioning and supplying the loads with the rest of equipments during the preventive maintenance or during the reparation of itself, in redundant systems.

  Under request a manual bypass panel can be supplied for a single equipment or a particular system.
- In parallel systems, the length and cross section of the cables that go from the switchgear panel till each UPS and vice versa, will be the same for all of them without any exception.
- Battery circuit is not isolated from input voltage. Hazardous voltages can be found out between the battery terminals and earth. Check that there is not input voltage before doing any intervention on them.

4.1. To be considered in the installation.

- Depending on the power of the equipment, there is a power cord with plug or it is hardwired for input and IEC outlets or hardwired for output, as connection parts for power. The rest of connections are done through the connectors, including the connection of the equipment with the battery module.
- Terminals for separate bypass line are only available in TWIN RT models higher than 3 kVA .
- Cross cable section of the bypass, input and output lines, will be calculated from the currents stated in the nameplate of each equipment, and respecting the Local and/or National Low Voltage Electrotechnical Regulations.
- Protections of the switchgear panel, will have the following features:
  - ❒ For input and bypass lines, type B for RCD devices and C characteristic for circuit breakers.
  - ❒ For the output (load feeding), C characteristic for circuit breaker.

  Regarding the size, they will be as minimum to the currents stated in the nameplate of each UPS.
- In the nameplate of the equipment there are only printed the nominal currents as it is stated in the safety standard EN-IEC 62040-1. To calculate the input current, the power factor and the efficiency of the equipment have been considered.

  Overload conditions are considered as nonpermanent and exceptional operating mode.
- If it is added peripherals to the input, output and/or bypass like transformers or autotransformers to the UPS, the currents stated in the own nameplates of those elements has to be considered in order to use the suitable cross sections, by respecting the Local and/or National Low Voltage Regulation.
- When an equipment incorporates a galvanic isolation transformer, as standard, as an option or either installed by yourself, either at the UPS input, bypass line, output or at all of them, protections against indirect contact has to be fitted in (residual current device) at the output of each transformer, because due to its specification of isolation it will prevent the triggering of the protections fitted in the primary of the transformer in case of electrical shock in the secondary (output of the isolation transformer).
- Remind you that all external isolation transformers already installed or supplied from factory, has the neutral of the secondary connected to earth by means of a cable bridge between both terminals. If it were required an isolated output neutral, remove this cable bridge, keeping the precautions stated in the respective local and/or national low voltage regulations.
- According to the most current trends, all the UPSs have batteries inside the same rack enclosure of the equipment, but in counterpart the resultant weight in the models from 4 to 10 kVA is notoriously high (see the stated weights in the table 13 and/or in the own packaging of the equipment).

  Attending the recommendations stated in section 1.2.3.2. regarding to weight handling and makes easy the installation of this power range in a rack cabinet when the handling labours are done manually, the battery block has to be removed from the equipment according to the procedure described in section 4.2.4..
- Battery protection is by means of fuse and internal, so it is no accessible by the end-user.

  Battery modules have internal protections by fuse, and they are not accessible by the end-user too.

4.2. Reception of the equipment.

4.2.1. Unpacking, content checking and inspection.

- To unpacking, see section 4.2.3.
- On receiving the device, make sure that it has not suffered any damage in transport (impact, drop, ...) and its features correspond with the ones in the order, so it is recommended to unpack the UPS and make a first visual inspection.
- In case of observing damages, make all pertinent claims to the transport agency or in their lack to our company.

  Never start up an equipment when external damages can be observed.
- Also check that the data in the nameplate sticked in the pack-

aging and in the equipment, correspond to the ones stated in the order, so it is required to unpack it (see section 4.2.3). Otherwise, make a nonconformity as soon as possible, by quoting the serial number of the equipment and references in the delivery note.

- Check the contents of the packaging. Depending, if we are checking an equipment or battery module, the contents will vary.
  - ❒ Equipment:
    - The own equipment.
    - Quick guide in paper.
    - 1 power cord for input connection -schuko plug and IEC connector- (Standard UPS of 3 kVA only).
    - 3 cables for output connection with IEC connectors (equipments up to 3 kVA only).
    - 1 communication cable RS232.
    - 1 communication cable USB.
    - 4 plastic pieces to be joint two by two to fit the UPS in vertical position (only equipments 4 to 6 kVA).
    - 2 metallic pieces and bolts to fit the UPS in vertical position (equipments higher than 3 kVA).
    - Two metallic pieces with L shape to adapt the equipment to rack format.
  - ❒ Battery module:
    - The own equipment.
    - 1 connection cable for protection earth, to link the equipment and module.
    - 2 plastic pieces to adapt the supports of vertical installation of the UPS and batteries (battery modules for equipments up to 3 kVA only).
    - 1 metallic piece and bolt to joint the battery module with the equipment on tower format.
- Once the reception is finished, it is advisable to pack the UPS and the battery module/s again till its commissioning in order to protect it against mechanical shocks, dust, dirt, etc...

4.2.2. Storage.

- Storage of the equipment will be done in a dry place, safeguard from rain, protected from dust, water jets or chemical agents. It is advisable to keep the equipment and the battery pack/s, into their original packages, which have been designed to assure the maximum protection during the transport and storage.
- In general and less in special cases, the UPS has sealed lead-calcium batteries and should not be stored for more than 12 months (see the date of the last charge of the batteries, noted on the label adhered to the device packaging or on the battery unit).
- After this period of time, connect the equipment to mains and together with battery module/s, if any, start it up according to the instructions described in this manual and charge them for 2 hours from floating level.

  In equipments higher than 3 KVA ready for its parallel connection, it is not needed to make the connection between the equipments to charge the batteries. It can be treated as separate units to charge them.
- Finally, shutdown the equipment, disconnect it and fit the UPS and batteries in their original packaging, noting the new battery charge date on each respective label.
- Do not store the devices where the ambient temperature exceeds above 50ºC or below –15ºC, otherwise it may degrade the electrical characteristics of the batteries.

4.2.3. Unpacking.

- The packaging of the equipment consists of a cardboard enclosure, expanded polystyrene corner pieces (EPS), polyethylene foam (EPE), polyethylene sleeve and band, all of them are recyclable materials; therefore they should be disposed according to current regulations. We recommend to keep the packaging in case its use is necessary in the future.
- Proceed as follows:
  - ❒ Cut the strips of cardboard enclosure.
  - ❒ Remove the accessories (cables, supports, ...)
  - ❒ Remove the equipment or battery module from the packaging, keeping in mind that the it is needed the help of a second person depending on the weight of the model or use the suitable mechanical mediums.
  - ❒ Remove the protection corners from the packaging and the plastic bag.

    Do not leave the plastic bag at the children hand, due to the risk that it means.
  - ❒ Check the equipment before proceeding and in case damages where confirmed, contact with the supplier or in lack of it with our firm.

4.2.4. Procedure to take out and install the batteries in equipments of 4 to 10 kVA.

- According to the current trends, all the UPSs have batteries inside the same rack enclosure of the equipment, but on the contrary the resultant weight from 4 to 10kVA models is very high (see weights stated in the table 13 and/or in the own packaging of the own equipment).

  Attending the recommendations stated in the section 1.2.3.2. regarding the weight manipulation and to make easier the installation of this power range in the rack cabinet when the manipulations are done by hand, the battery block has to be removed from the equipment.

  Proceed as follows to remove the battery block or pack, based on one pack for 4 to 6 kVA models and two packs for 8 and 10 kVA models (see figure 4):
  - ❒ Remove the front beautiful cover of the equipment according to the procedure described in section 4.2.5.2., considering that 8 and 10 kVA models there is a second front cover, which has to be removed too in the same way.
  - ❒ Remove the blocking cover/s from battery pack, removing the fixing screws first.
  - ❒ Using the handle that each battery pack has, remove the battery block by pulling from it till removing it completely.

    Consider that each battery pack is wired and connected to the electronic unit by means of a fast connection connector, so there could be some resistance to its disconnection.

    In 8 and 10 kVA models remove the second battery pack.
- Depending on the required assembling type, vertical -tower type - or to be installed in the rack cabinet, proceed as it is described in the respective sections.
- Finally, insert the battery pack/s again.

  When fitting in the battery block, make sure that it is inserted till the end. The correct electrical joint between the connector

of the battery pack and the equipment depends on it.

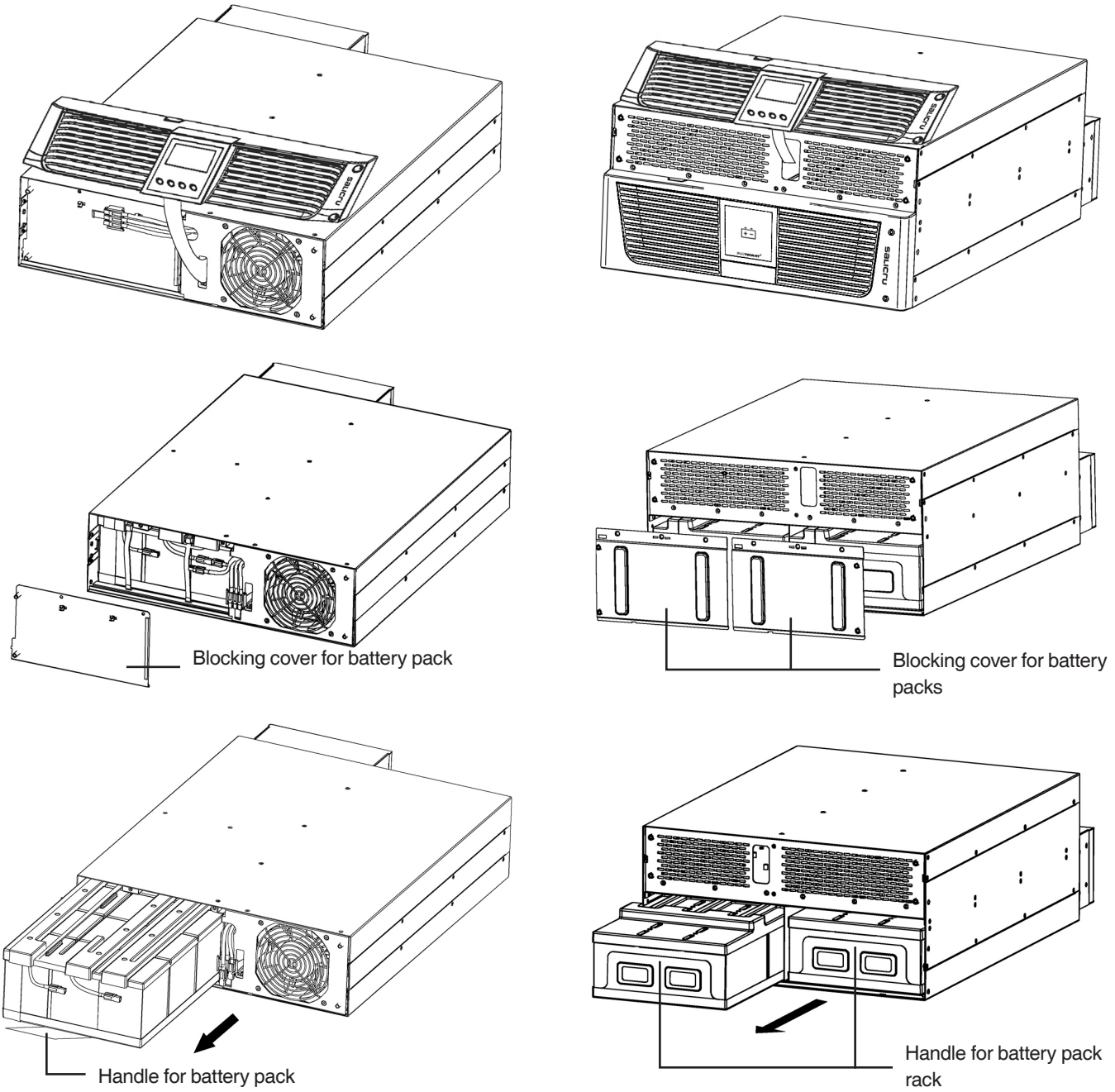
- Put the blocking cover back for the battery pack and its fixing screws.

  If this cover is not properly fixed against the metallic chassis, check that the battery pack is completely inserted.
- Put the beautiful front/s cover back depending on the equipment, according to the described procedure in section 4.2.5.2..

4.2.5. Vertical -tower type- or rack models.

- All the UPSs from **SLC TWIN RT** series are designed to assemble the equipment as tower format -vertical position of the equipment- or rack -horizontal position- for its installation in 19" cabinets.

  Follow the instructions stated in the sections related to any of both possibilities, attending the particular configuration of your equipment.
- Figures from 5 to 10 show as an example an equipment up to 3 kVA. These illustrations are only for help and orientation in the steps to follow and they are not particular for any model, because in practice, the actions to make are the same for all models up to 6 kVA.



Power rate models from 4 to 6 KVA.

Power rate models from 8 to 10 KVA.

Fig. 4. Battery pack/s removing.

8 to 10 kVA models, the connection with battery modules for extended back up time, it is done through a connector located in the rear side of the equipment (see figure 11).

- All the instructions relating to connections will detailed later on, less those ones regarding the battery connection. Therefore, this section will only describe the works linked with the assembling.

4.2.5.1. Rotation of control panel with LCD.

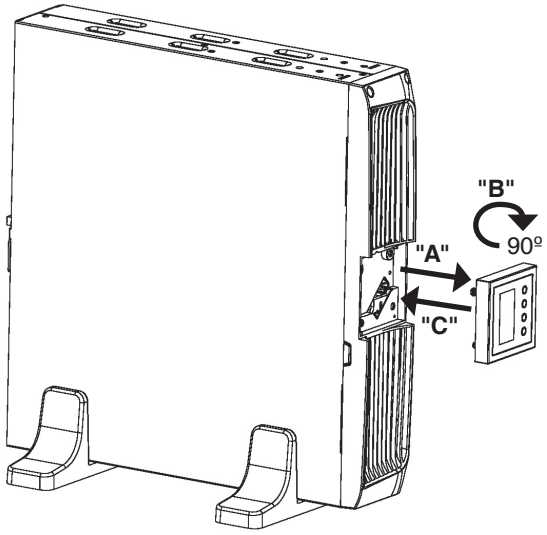


Fig. 5. Rotation of control panel with LCD over the beautiful front plastic cover.

- To make easier the message reading when the equipment is vertically installed, it is advisable to rotate 90º clockwise the control panel with LCD (see figure 4).
- Also, it is advised to rotate the control panel, if any tower type equipment requires to be assembled as rack. Consider that the rotation of the control panel will be counter clockwise.
- Proceed as follows:
  - ❒ Pull from the control panel with LCD out "A", to free the fixing clips and take it out.

    Rotate it 90º on clockwise "B" and insert it again into the beautiful front cover till click it "C".

4.2.5.2. Taking out or putting the beautiful front cover.

- To take out the beautiful front cover, proceed as follows (see figure 6):
  - ❒ Take out the control panel "A" (see section 4.2.5.1) and remove the fixing screw "B" of the beautiful front door located below the first one and put the own control panel back.
  - ❒ Remove the two fixing screws "C" from beautiful plastic front cover.
  - ❒ Move the front cover to "D" direction, by applying a hard and moderated knock on its side (side without screws), to free the trim entered into the metallic frame.

    The front is free, but still joint to the equipment through the connection bus of the control panel.
- To put the beautiful front cover back, proceed in the reverse way to its removing.

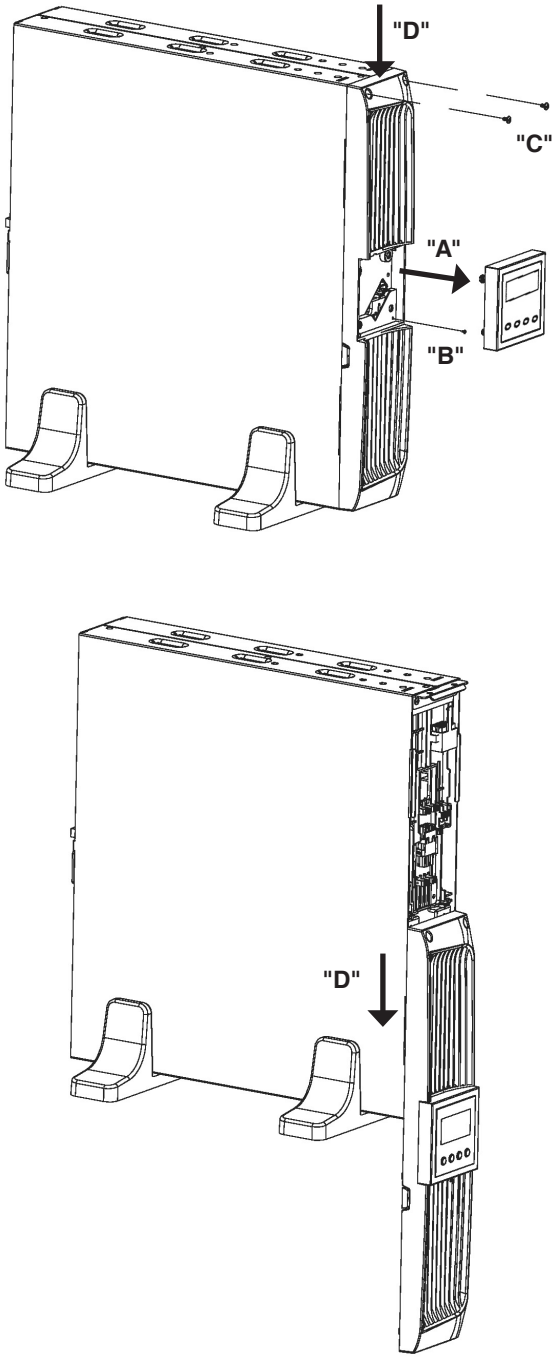


Fig. 6. Taking out the beautiful front cover.

4.2.5.3. Vertical -tower type-assembling.

- Rotate the control panel according to section 4.2.5.1.
- In equipments up to 3 kVA, take the 4 plastic pieces "A" in angle shape supplied with the equipment and joint them two by two till obtain two supports or stabilizers "B".
- <u>For equipments up to 3 kVA.</u>
  - ❒ Put the UPS vertical between the two stabilizers supports "B" (see figure 7).

  <u>For equipments of higher power.</u>
  - ❒ Put the equipment vertical and fix the two metallic supports, one at each side, by means of the supplied screws (models 4 to 6 KVA).
  - ❒ For equipment of 8 to 10 kVA, put the equipment vertical. There are not supports or stabilizers.

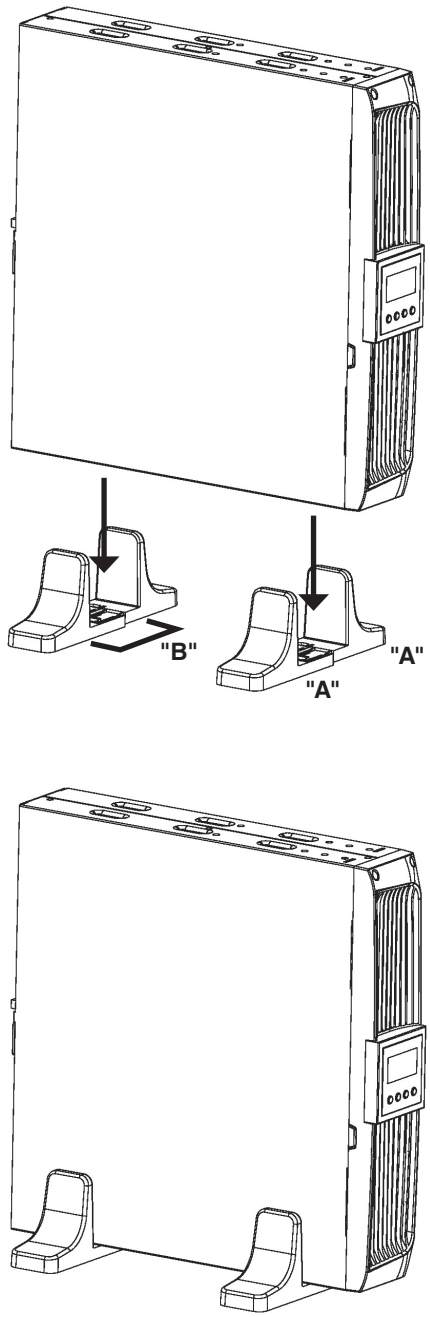


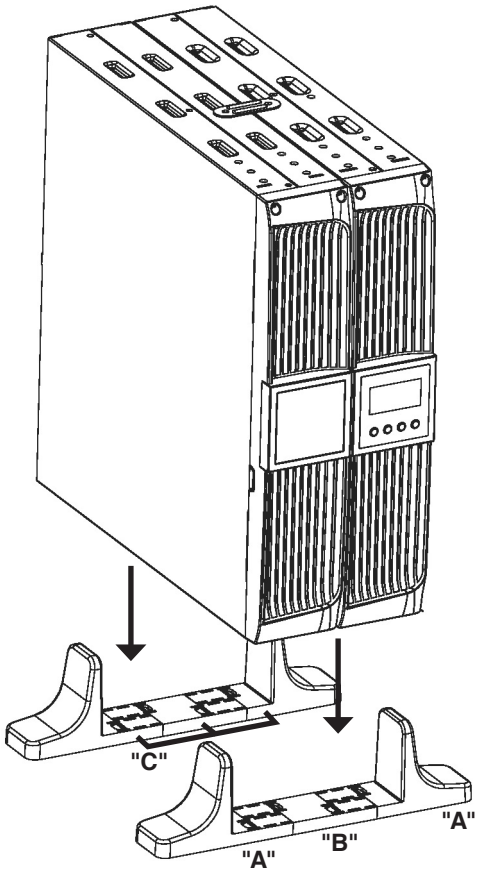
Fig. 7. Vertical -tower type- assembling.

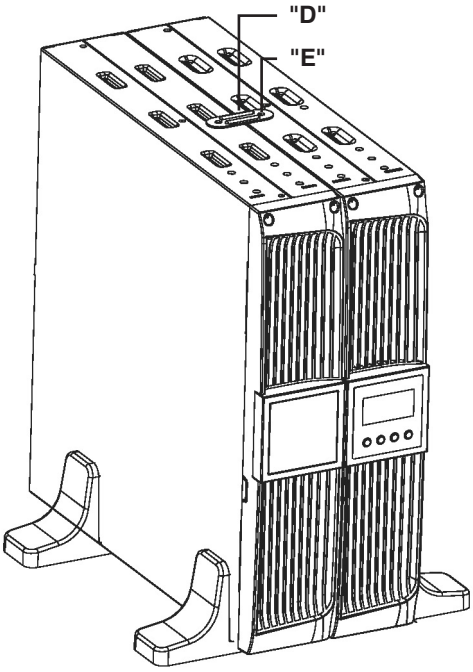
4.2.5.4. Vertical -tower type- assembling, with extended back up time (battery module).

- The description of this section is based on an equipment with only one battery module (see figure 8). For a higher quantity of modules proceed to the connection among them.
- Rotate the control panel of the equipment according to section 4.2.5.1.
- In equipments up to kVA, take the 4 plastic pieces "A" with angle shape and supplied with the UPS and the two supplied with the battery module "B", and joint them till obtain two supports or stabilizers "C" to hold the equipment and battery module.
- <u>For equipments up to 3 kVA.</u>
  - ❒ Put the UPS and battery module on vertical position between the stabilizers supports "C".
  - ❒ Fix the "D" metallic piece that joint UPS and battery module by means of the supplied screws "E".

<u>For equipments of higher power.</u>

- ❒ Put the equipment and battery module in vertical position and together. Next fix the two metallic supports by means of the supplied screws, one on the side of the equipment and other one on the side of the battery module, in the UPS 4 to 6 kVA.
- ❒ For equipment of 8 to 10 kVA, put the equipment vertical. There are not supports or stabilizers.
- ❒ Fix the joint metallic piece between the UPS and battery module by means of the supplied screws.





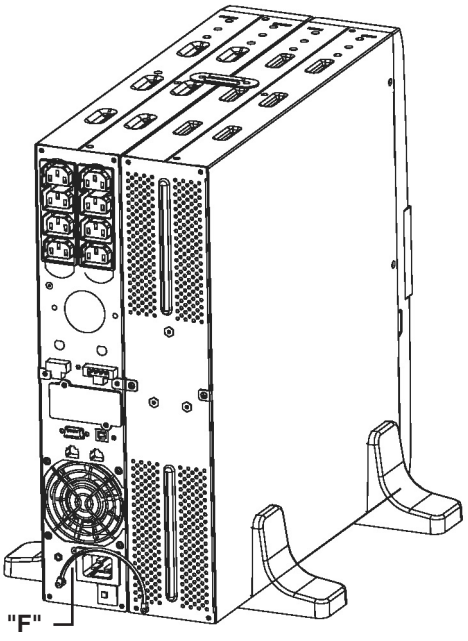


Fig. 8. Model in vertical -tower type- assembling with extended back up time (battery module).

- Regarding the connections of the UPS with the battery module in models up to 6 kVA, make the following steps, but reading section 4.3.4 previously:
  - ❒ Connect the supplied earth joint cable "F", between the UPS and battery module.
  - ❒ Remove the beautiful front cover of the equipment and battery module, as it is described in section 4.2.5.2.
  - ❒ Take the extensible cable with connector "H" of the battery module and connect it with the "G" connector of the equipment.

    To connect it with other battery modules, there is the "J" connector. Take the extensible cable with "H" connector of the beside battery module and connect it to the "J" connector of the previous one. Repeat the same steps for a high quantity of modules.
  - ❒ In the side of each front cover, there are the "K" trims as hole to go the cables through it with the battery modules. Break the needed trims to pass the connection bus.
  - ❒ Put the beautiful front cover back of the equipment and battery module, as it is stated in section 4.2.5.2.
- For 8 and 10 kVA UPSs with the battery module, proceed as follows, but reading section 4.3.4 previously (see figure 11):
  - ❒ Connect the supplied earth joint cable , between the UPS and battery module.
  - ❒ To connect the battery module with the equipment, there is a connector on the rear side of both units. Insert the aerial connector from battery module into the connector of the equipment.
  - ❒ Battery module has base connector, foreseen to connect the aerial connector from another module .

4.2.5.5. 19" rack cabinet mounting.

- All models can be installed in a 19" rack cabinet, attending the height of each model:
  - ❒ Models up to 3 kVA, 2 units height.
  - ❒ Models from 4 and 6 kVA,3 units height.
  - ❒ Models of 8 and 10 kVA, 5 units height.

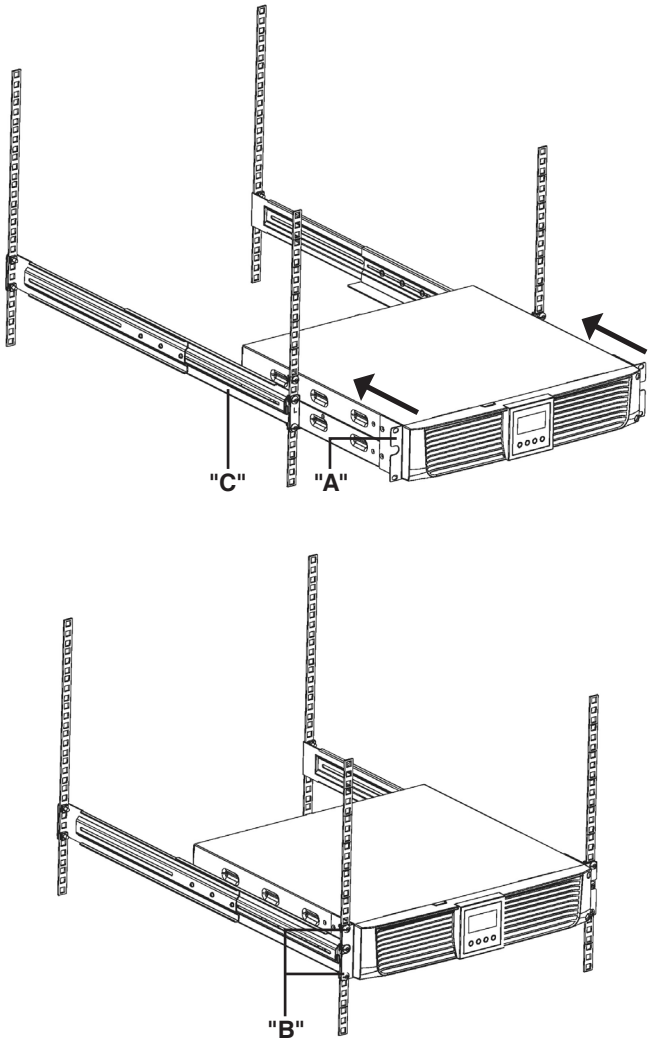


Fig. 9. 19" rack cabinet assembling.

- To do it proceed as follows (see figure 9):
  - ❒ Fix both adaptor angles "A" of the equipment as rack, to its side by means of the supplied screws.
  - ❒ Put a UPS in a rack cabinet, it is needed to have the side internal as support mode "C". In lack of them and under request, a rails can be supplied as a guide, to be installed by the end user. Make the assembling at the required height, assuring the correct torque of the fixing screws.
  - ❒ Face the equipment over the rails and enter it to the bottom.

    Depending on the model of the equipment and as a result of the weight, it is recommended to make the installation works by two persons, and even more when they are done on the top and bottom of the cabinet.
  - ❒ Fix the equipment to the frame of the cabinet by means of the screws "B".

4.2.5.6. 19" rack cabinet assembling, with extended back up time (battery module).

- This section describes a single equipment with only one battery module (see figure 10). For higher quantity of modules reproduce the connection procedure among them.
- All models can be installed in a 19" rack cabinet, keeping in mind the height of each model:
  - ❒ Models up to 3 kVA, height of 2 units.
  - ❒ Battery module for models up to 3 kVA, height of 2 units.
  - ❒ Models from 4 to 6 kVA, height of 3 units.
  - ❒ Models of 8 and 10 kVA, height of 5 units.
  - ❒ Battery module for models from 4 to 10 kVA, height of 3 units.
- To do this, proceed as follows:
  - ❒ Fix both adaptor angles "A" to the equipment and to the battery module as rack, on their side, by means of the supplied screws.
  - ❒ Put a UPS in a rack cabinet, it is needed to have the side internal as support mode "C". In lack of them and under request, a universal rails can be supplied as a guide, to be installed by the end user. Make the assembling at the required height, assuring the correct torque of the fixing screws.
  - ❒ Face the equipment over the rails and enter it to the bottom. Proceed in the same way for the battery module.

    Depending on the weight of model of the equipment and battery module, it is recommended to make the installation works by two persons.
  - ❒ Fix the equipment to the frame of the cabinet by means of the screws "B".
- Regarding the connections of the UPS with the battery module in models up to 6 kVA, make the following steps, but reading section 4.3.4 previously:
  - ❒ Connect the supplied earth joint cable "F", between the UPS and battery module.
  - ❒ Remove the beautiful front cover of the equipment and battery module, as it is described in section 4.2.5.2.
  - ❒ Take the extensible cable with connector "H" of the battery module and connect it with the "G" connector of the equipment.

    To connect it with other battery modules, there is the "J" connector. Take the extensible cable with "H" connector of the beside battery module and connect it to the "J" connector of the previous one. Repeat the same steps for a high quantity of modules.

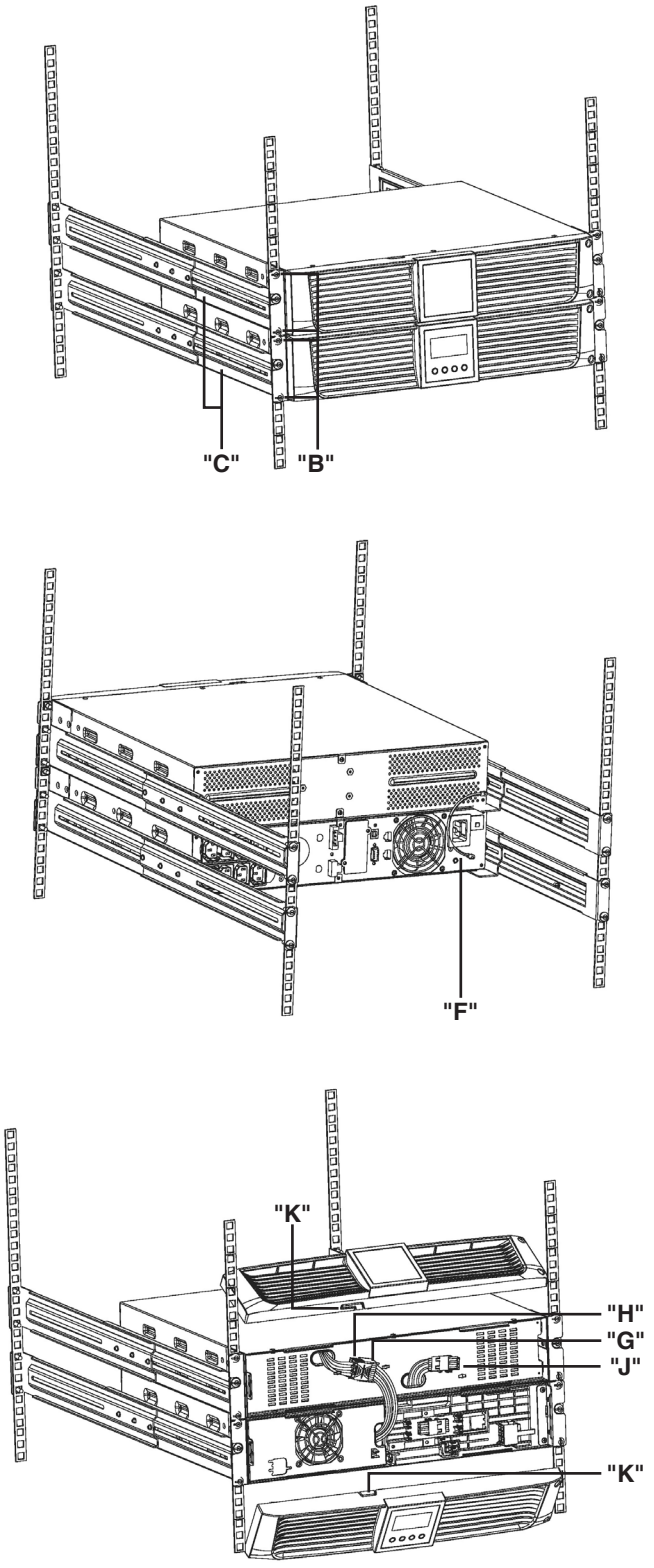


Fig. 10. 19" rack cabinet assembling, with extended back up time (battery module).

  - ❒ In the side of each front cover, there are the "K" trims as hole to go the cables through it with the battery modules. Break the needed trims to pass the connection bus.
  - ❒ Put the beautiful front cover back of the equipment and battery module, as it is stated in section 4.2.5.2.

- Regarding the connections of the UPS with the battery module in models of 8 and 10 kVA, make the following steps, but reading section 4.3.4 previously (see figure 11):
  - ❒ Connect the supplied earth joint cable, between the UPS and battery module.
  - ❒ To connect the battery module with the equipment, there is a connector on the rear side of both units. Insert the aerial connector from battery module into the connector of the equipment.
  - ❒ Battery module has base connector, foreseen to connect the aerial connector from another module.

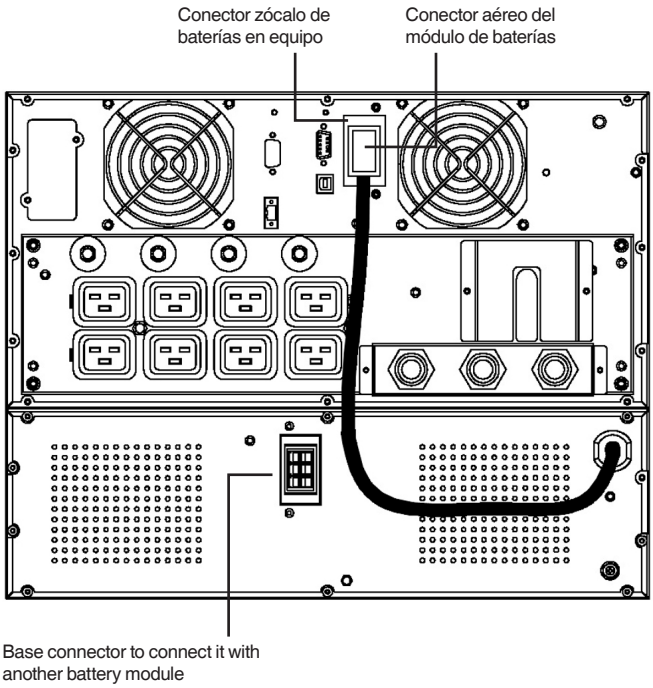

Conector zócalo de baterías en equipo
Conector aéreo del módulo de baterías
Base connector to connect it with another battery module

Fig. 11. Battery module connection for 8 and 10 kVA equipments.

4.3. Connection.

- ⚠ Cross cable section used in the power supply of the equipment and loads to feed, will be sized according to the nominal current stated in the nameplate sticked on the equipment, by respecting the Low Voltage Electrotechnical Regulations or norms of the corresponding country.
- Installation will have the suitable input protections sized to the current of the equipment and stated in the nameplate of the equipment (residual current devices type B and circuit breaker with C characteristic or any other equivalent one).

  Overload conditions are considered as a nonpermanent an exceptional operating mode, so these currents will not be kept in mind when sizing the protections.
- Output protection will be done with a circuit breaker of C characteristic or any other equivalent one.
- ⚠ The equipments can be installed and used by personnel with not specific training, just with only help of this «Manual», less those ones with power blocks have to be installed by qualified personnel.
- In the hardwired models, is needed to remove the fixing screws of the protection cover and the own cover, to proceed to the parallel connection.

  Also the equipments from 4 to 10 kVA have cable glands in the own cover, through them the cables can be conducted and fixed.

  When finalising the corresponding tasks, the cover will be installed and its fixing screws again.
- To insert the option cards, it is needed to remove the fixing screws of the smart slot and the own cover.

  When finalising the corresponding tasks, the cover will be installed and its fixing screws again.
- It is recommended to use terminals in all the cable ends, which are connected to the power blocks, specially in the power ones (input, output and bypass).
- Check the correct torque in the screws of the power blocks.

4.3.1. Connection of input.

- ⚠ As this is a device with class I protection against electric shocks, it is essential to install a protective earth conductor (connect earth(⏚)). Connect the conductor to the terminal, before connecting the power supply to the input power block.
- Equipments with IEC outlets (models from 0,7 to 2 kVA):
  - ❒ Take the power cord with schuko plug and IEC connector.
  - ❒ Connect the IEC connector to the UPS inlet.
  - ❒ Insert the schuko plug to the AC mains outlet.
- In equipments with power blocks (3 kVA models).

  Connect the power supply cables to input power blocks **R (L)**, and **N**, by respecting the phase and neutral rotation **stated in the labelling of the equipment and in this manual**. If this rotation is not respected, serious faults could happen.

  ⚠ The main earth input protection is located between the phase and neutral terminal. Pay special attention to the correct connection.

  When discrepancies exist between the labelling and the instructions of this manual, the labelling will always prevail.
- For hardwired equipments (models from 4 to 10 kVA).
  - ❒ ⚠ These equipments have separate power blocks for the static bypass line. For installations with only one power supply, put a cable as a bridge mode "Jumper" between the terminals **JP** and **L** (bypass phase line).

    Do not fit this "Jumper" bridge, if the equipment is a frequency converter (see figure 13).
  - ❒ In accordance with safety standard EN-IEC 62040-1, the installation has to be provided with an automatic «Backfeed protection» system, as for example a contactor, which will prevent the appearance of voltage or dangerous energy at the input line during a mains fault (see figure 12 and respect the circuit diagram of the particular «Backfeed protection» for the equipment without bypass line).

    ⚠ There can be no derivation in the line that goes from the «Backfeed protection» to the UPS, as the safety standard would be infringed.

    It is not needed to install the «Backfeed protection», in case the equipment is a frequency converter, because the own operating principle of the equipment disables the possibility of having bypass line.
  - ❒ Warning labels should be placed on all primary power switches installed in places away from the device to alert the electrical maintenance personnel of the presence of a UPS in the circuit be infringed.

The label will have the following text or an equivalent one:

Before working on this circuit.

- Isolate Uninterruptible Power System (UPS).
- Then check for Hazardous Voltage between all terminals including the protective earth.

Risk of Voltage Backfeed from UPS.

❒ Connect the power supply cables to input power blocks **R (L)**, and **N**, by respecting the phase and neutral rotation **stated in the labelling of the equipment and in this manual (see figure 13)**. If this rotation is not respected, serious faults could happen.

When discrepancies exist between the labelling and the instructions of this manual, the labelling will always prevail.

❒ In parallel systems, the length and cross section of the cables that go from the switchgear panel till one of the UPSs and vice versa, will be the same for all of them without any exception.

4.3.2. Connection of the static bypass power blocks (> 3 kVA models power rate only).

- These equipments have separate power blocks for the static bypass line. For installations with two power supplies, the cable as a bridge mode "Jumper" between the terminals **JP** and **L** (bypass phase line) doesn't need to be fitted, otherwise a short-circuit can be made when turning on the protection of both lines.
- As this is a device with class I protection against electric shocks, it is essential to install a protective earth conductor (connect earth(⏚)). Connect the conductor to the terminal, before connecting the power supply to the input power block.
- In accordance with safety standard EN-IEC 62040-1, the installation has to be provided with a «Backfeed protection» system, as for example a contactor, which will prevent the appearance of voltage or dangerous energy at the bypass line during a mains fault (see figure 12 and respect the circuit diagram of the particular «Backfeed protection» for the equipment with bypass line.

  There can be no derivation in the line that goes from the «Backfeed protection» to the UPS, as the safety standard would be infringed.
- Warning labels should be placed on all primary power switches installed in places away from the device to alert the electrical maintenance personnel of the presence of a UPS in the circuit.

  The label will have the following text or an equivalent one:

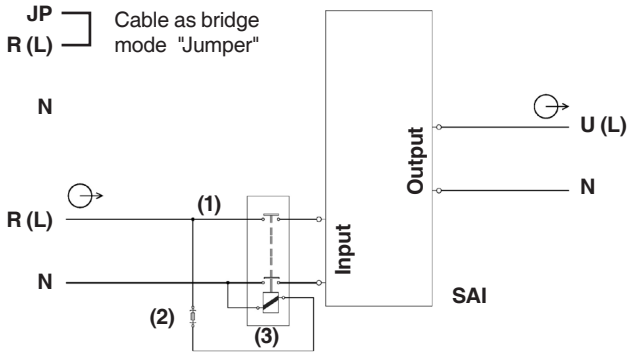
Before working on this circuit.

- Isolate Uninterruptible Power System (UPS).
- Then check for Hazardous Voltage between all terminals including the protective earth.

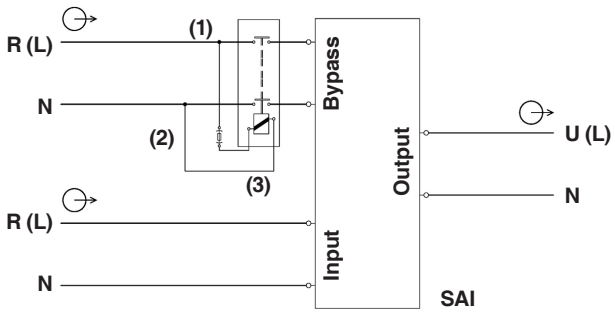
Risk of Voltage Backfeed from UPS.

- Connect the power supply cables to input power blocks **R (L)**, and **N**, by respecting the phase and neutral rotation **stated in the labelling of the equipment and in this manual (see figure 13)**. If this rotation is not respected, serious faults could happen.

  When discrepancies exist between the labelling and the instructions of this manual, the labelling will always prevail.
- In parallel systems, the length and cross section of the cables that go from the switchgear panel till one of the UPSs and vice versa, will be the same for all of them without any exception.



«Backfeed protection» connection for TWIN RT > 3 kVA with no static bypass line (Jumper fitted in.



«Backfeed protection» connection for TWIN RT > 3 kVA with static bypass line (no Jumper).

(1) Automatic «Backfeed protection» protection system, external to the UPS (EN-IEC 62040-1).

(2) Fuse holder and fuse for general purpose of 250V AC / 3A type F.

(3) Two poles contactor of 230V AC with a minimum distance between contact of 1,4 mm and coil of the same voltage, with the minimum current stated in the nameplate of the UPS (input or bypass according to).

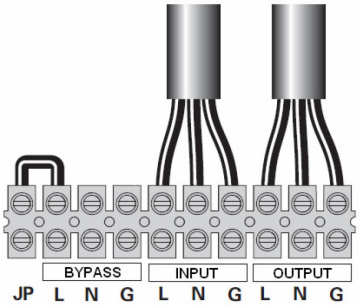
ⓘ For parallel systems, each equipment must have its own "Backfeed protection" completely independent.

Fig. 12. Wiring diagram for "Backfeed protection".

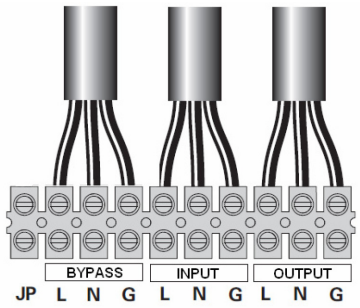
- In equipments with separate bypass line, a galvanic isolation transformer has to be installed in any of the two lines that supply the UPS (rectifier input or static bypass), to avoid the direct union of the neutral of both lines through the internal wiring of the equipment.

  This is applicable when the two lines are supplied from different mains, i.e.:

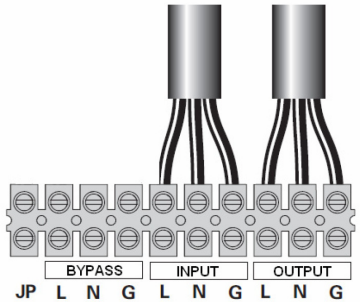
  - ❒ Two different electrical companies.
  - ❒ An electrical company and genset, ...



UPS TWIN RT > 3 kVA with no bypass line.



SAI TWIN RT > 3 kVA with bypass line.



Frequency converter TWIN RT > 3 kVA.

Fig. 13. Power block connection depending on the equipment.

4.3.3. Connection of the IEC outlets and output power blocks.

- As this is a device with class I protection against electric shocks, it is essential to install a protective earth conductor (connect earth(⏚)). Connect the conductor to the terminal, before connecting the power supply to the input power block.
- All the equipments have female IEC outlets, in greater or lesser numbers depending on the power rate of the equipment:
  - ❒ Models up to 2 kVA: 2 groups of 4 IEC outlets of 10A labelled as LS1 and LS2, which can be set through the control panel and/or Win Power.
  - ❒ Models of 3 kVA: 2 groups of 4 IEC outlets of 10A labelled as LS1 and LS2, which can be set through the control panel and/or Win Power, plus a IEC connector of 16A.
  - ❒ Models from 4 to 6 kVA: 2 groups based on 2 IEC outlets of 10A and 1 of 16A each one.

    Each group has an automatic protection switch. In case of tripping, the load connected to the respective outlet has to be checked, otherwise the protection will be activated and deactivated cyclically, and therefore the loads will suffer the consequences.
  - ❒ Models of 8 and 10 kVA: 4 groups based on 2 IEC outlets of 16A each one.

    Each group has an automatic protection switch. In case of tripping, the load connected to the respective outlet has to be checked, otherwise the protection will be activated and deactivated cyclically, and therefore the loads will suffer the consequences.
- For hardwired equipments (models from 4 to 10 kVA).
  - ❒ Connect the loads to output power block **U (L)** and **N**, by respecting the phase and neutral rotation stated in the labelling of the equipment and this manual (see figure 13).

    When discrepancies exist between the labelling and the instructions of this manual, the labelling will always prevail.
  - ❒ Loads can be connected to the IEC outlets, to the output power blocks or to both at the same time, meanwhile the features of the equipment and IEC outlets limitations are not exceeded, otherwise there will be sudden blackouts in the power supply of the connected loads at the output.
- If besides of the critical loads, it is required to connect lagging loads of high consumption, like laser printers or CRT monitors, the inrush currents of these peripherals will be kept in mind in order to avoid blocking the equipment under the worst conditions.

  It is better to not connect the loads of this kind, due to the high quantity of energy resources that take from the UPS.
- In parallel systems, the length and cross section of the cables that go from the switchgear panel till one of the UPSs and vice versa, will be the same for all of them without any exception.
- With respect to the protection that must be placed at the output of the UPS, we recommend that the output power should be distributed in at least four lines. Each one should have a circuit breaker protection switch of a value of one quarter of the nominal power. This type of power distribution will allow that in the event of a breakdown in any of the machines connected to the device causing a short-circuit, it will affect to no more than the line that is faulty.

  The rest of the connected loads will have their continuity assured due to the triggering of the protection, because the line affected by the short-circuit will trip its protection.

4.3.4. Connection of the external batteries (extended back up time).

- As this is a device with class I protection against electric shocks, it is essential to install a protective earth conductor (connect earth(⏚)). Connect the conductor to the terminal, before connecting the power supply to the input power block.
- **To not respect the stated indications in this section and the safety instructions 1.2.3 means a high risk of electrical discharge and even the death.**
- To connect the batteries with the equipment, follow the described steps in sections 4.2.5.4 and 4.2.5.6.
- All the standard UPSs have batteries in the same enclosure, less the B0 and B1. Battery protection is done by internal fuses and not accessible for the end-user.

  Battery modules have internal protections for the batteries too and they are not accessible for the end-user.
- IMPORTANT FOR SAFETY: In case of installing the batteries by yourself, the accumulators has to be provided with a two pole circuit breaker protection sized to the features stated in table 3.

Model	Batteries ($U_{element}$ x Nº) = $U_{nominal}$ / $U_{floating}$	Minimum features of fast type	
		Voltage DC (V)	Current (A)
SLC-700-TWIN RT	(12 V x 3) = 36 V / 41,25 V	125	32
SLC-1000-TWIN RT			40
SLC-1500-TWIN RT	(12 V x 4) = 48 V / 55 V		50
SLC-2000-TWIN RT			60
SLC-3000-TWIN RT	(12 V x 6) = 72 V / 82,5 V		60
SLC-4000-TWIN RT	(12 V x 15) = 180 V / 206,25 V	250	32
SLC-5000-TWIN RT			40
SLC-6000-TWIN RT			50
SLC-8000-TWIN RT	(12 V x 20) = 240 V / 275 V	440	50
SLC-10000-TWIN RT			60

Tabla 3. Specifications of the protection between the equipment and battery module.

- **Before starting the connection between the battery module/s and the equipment, check that the equipment switch/es and the one in the battery cabinet are in "Off" position.**

  Likewise when batteries are installed by own self, the fuse or switch has to be turned off.
- Connection terminals of external batteries with the equipment are done with a polarised Anderson connector.
- For battery connection with the equipment, follow the stated steps in sections 4.2.5.4 and 4.2.5.6, keeping in mind the model.
- In parallel systems (4 to 10 kVA models only), the connection of the external battery modules with each equipment has to be treated as single and separate units.
- Each battery module is independent for each equipment. It is completely forbidden to connect to equipments to the same battery module.

4.3.5. Connection of main input earth terminal (⏚) and the earth bonding terminal (⏚).

- As this is a device with class I protection against electric shocks, it is essential to install a protective earth conductor (connect earth(⏚)). Connect the conductor to the terminal, before connecting the power supply to the input power block.
- Make sure that all the loads connected to the UPS are only connected to the protective earth bonding terminal (⏚). The fact of not restricting the earthing of the load or loads and/or the batteries case/s or cabinet/s to this single point will create a return loops to earth which will affect the quality of the supplied power.
- All terminals identified as earth bonding (⏚), are joined together, to the main protective earthing terminal (⏚) and to the frame of the device.

4.3.6. Terminals for EPO (Emergency Power Off).

- All UPSs have two terminal to install an external button, for Emergency Power Off (EPO). Nevertheless, depending on the power rate of the equipment, it is supplied a four pins connector with the remote shutdown ON-OFF (models from 0,7 to 3 kVA) or a single connector and individual of two pins (models from 4 to 10 kVA).

  As an illustration mode, figures A and B, it is shown a connector of two pins.
- By default, the equipment is supplied from factory with the EPO circuit as open (NO). So, the UPS will break the output power supply, emergency power off, when opening the circuit:
  - ❒ Either by removing the female connector inserted in the plinth. This connector has a cable bridge to close the circuit (Fig. A).

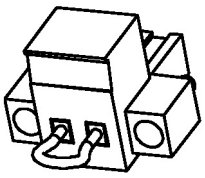


Fig. A

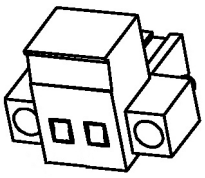


Fig. B

  - ❒ Or by turning on the external button installed and belonging to the end-user. The connection in the button has to be in normally closed because it will open the circuit when turning it on.
- Through the control panel, it can be selected the reverse functionality, normally closed (NC).

  Less punctual cases, it is not recommended to use this type of connection due to the function of the EPO button, because it would not work in case of any of the two cables that goes from the button to the UPS were cut (damaged).

  On the other hand this failure would be immediately detected in the normally open EPO type, with the inconvenience of the sudden break in the power supply to the loads, but with a complete guarantee of the functioning of the emergency power off.
- To restore the normal operating mode of the UPS, the connector with the cable bridge has to be fitted back in the terminal strip or to deactivate the EPO button and later on to cancel the EPO status in the control panel . The equipment will be operative.

4.3.7. "Dry_in" terminals, remote ON-OFF (0,7 to 3 kVA equipments only).

- The equipments from 0,7 to 3 kVA have a 4 pins connector, two for the EPO (see the description in the previous section) and two for remote start up and shutdown "Dry_in".
- Through these terminals, an external button can be connected, with the same function that the own in the UPS.
- When pressing, over it for 1 second, the circuit will activate the opposite order of the current status of the inverter, so, if it is shutdown then it will be started up and vice versa, if the inverter is started up then it will be shutdown (see figure 14).

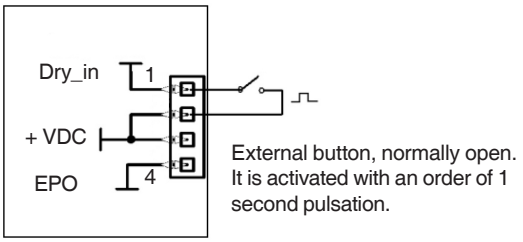


Fig. 14. Button installation in the "Dry_in" terminals.

4.3.8. "Dry_out" terminals, dry contact for alarm (0,7 to 3 kVA equipments only).

- The equipments from 0,7 to 3 kVA are supplied with a normally open dry contact "Dry_out", which is closed when activating of any on or more associated alarms "Summary Alarm" from Table 4.
- Do not apply more than 30V AC 1A or 60V DC 2A. Dry contact, do not connect both phases between the contacts, because there would be a short-circuit when triggering the alarm because the circuit is closed.

Fig. 15. Dry contact "Dry_out".

BUS Over Voltage	**Inv Under Voltage**
BUS Under Voltage	**Inv Softstart Fail**
BUS Unbalance	**Output Overload**
BUS Short	**Inv Overload Fault**
BUS Softstart Fail	**Byp Overload Fault**
Output Short Circuit	**Heatsink Over temperature**
Inv Over Voltage	-

Table 4. Associated alarms to "Summary alarm" for Dry_out contact.

4.3.9. Connection in parallel.

4.3.9.1. Introduction to the redundancy.

N+1 is usually the most reliable power structure. N means the minimum quantity of equipments that the total load needs, so 1, and 1 means the quantity of redundant equipments, so it means, the quantity of faulty UPSs that the system can allow at the same time.

TWIN RT series allows two equipment connected in parallel only, for those models with power rate between 4 and 10 kVA, in order to set a shared output and redundant in power.

4.3.9.2. Installation and parallel operating (4 to 10 kVA equipments only).

- Communication line (COM) is a very low voltage circuit of safety. To preserve the quality, it has to be installed separate from other lines that have dangerous voltages (energy distribution line).
- **Parallel connection bus**. Use the bundle with 25 signal cables with mesh and DB25 connectors in the ends to joint up to 2 equipments as maximum. Each bundle has a male and female connector in the ends, which will have to be connected to joint both equipments. It is essential to close the loop of the parallel bus.

  The length of the parallel cable has 3 metres and it can't be extended under any other concept due to the risk of interferences and communication failures that it could cause.
- The installation of the parallel systems, has to be provided by a switchgear panel with individual protections for input, output and static bypass (this last one, in those installations that uses the second line only), also a manual bypass with mechanical lock, see figures 16 and 17.

  This switchgear panel allows isolating only one equipment from the system, against any failure and feed the loads with the rest of equipments during the preventive maintenance or its fixing. In the same way, it allows removing an equipment in parallel and replace it or put it in parallel again once it is fixed, but without breaking the power supply to the loads meanwhile the connected power can be supported by the operative equipment.

  Under request a manual bypass panel can be supplied for a single equipment or a system of two equipments in parallel.
- Respect the connection procedure for input and bypass described in the previous sections of this chapter.
- Respect the established procedure to make the connection of the battery modules for those equipments with extended back up time, which has been described in the previous sections of this chapter.
- Respect the established procedure to make the connection of the output (loads), which has been described in the previous sections of this chapter.
- Respect the established procedure to make the connection of the output and batteries of the equipment, which has been described in the previous sections of this chapter.
- In parallel systems, the length and cross section of the cables that go from the switchgear panel till one of the UPSs and vice versa, will be the same for all of them without any exception.

  In the worst case, the following deviations have to be strictly respected:

  ❒ When the distance among the UPSs and protection panel is lower than 20 metres, the difference in the length between the input and output cables of the equipments has to be lower than 20%.

❒ When the distance among the UPSs and the protection panel is higher than 20 metres, the difference in the length between the input and output cables of the equipments has to be lower than 10% .

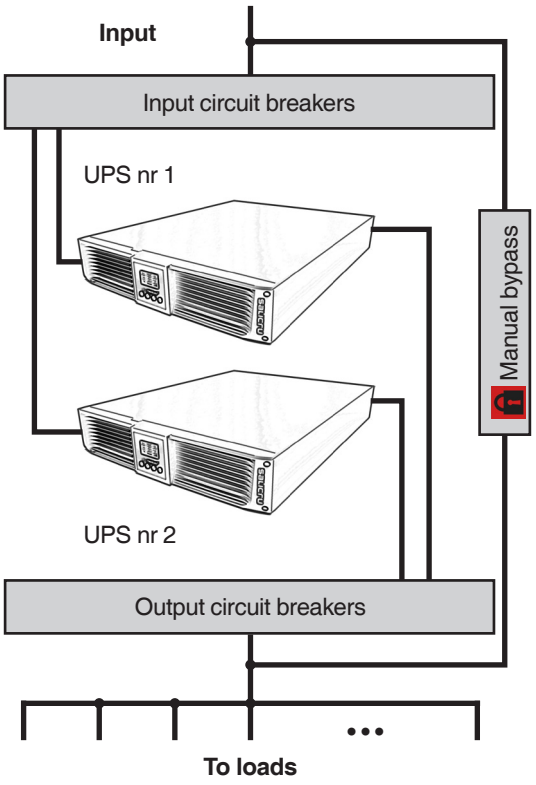


Fig. 16. Parallel installation of two TWIN RT UPSs from 4 to 10 kVA, with protection and manual bypass panel.

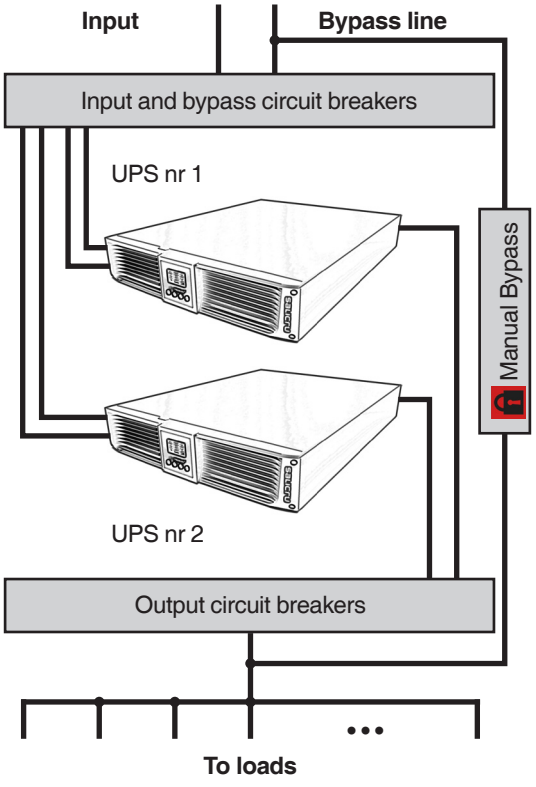


Fig. 17. Parallel installation of two TWIN RT UPSs from 4 to 10 kVA, with bypass line and protection and manual bypass panel.

4.3.10. Communication ports.

4.3.10.1. RS232 and USB interfaces.

- Communication line (COM) is a very low voltage circuit of safety. To preserve the quality, it has to be installed separate from other lines that have dangerous voltages (energy distribution line).
- RS232 and USB interfaces are used by the monitoring software and firmware updating.
- It is not possible to use both ports at the same time.
- Signal pin-out of the DB9 connector are shown in table 5.

  RS232 port consists in a serial data transmission, so an important quantity of information can be sent through a communication cable of 3 wires.
- Physical structure of RS-232.
  - ❒ Pin 2. RXD. Serial data reception.
  - ❒ Pin 3. TXD. Serial data transmission.
  - ❒ Pin 5. GND. Ground of the signal.

Pin #	Description	Input / Output
2	TXD	Output
3	RXD	Input
5	GND	Input

Tabla 5. Pin-out of the RS232 in the DB9 connector.

- USB communication port is compatible with the USB 1.1 protocol for communication software.

4.3.10.2. Smart slot.

- UPSs have a unique slot, hidden rear the cover stated in the views of the equipment as "Smart slot", and allows inserting any of the following options cards:
  - ❒ SNMP for control via Web.
  - ❒ Remote UPS management through Internet or Intranet.
  - ❒ Relays interface (for more details see the next section).
- For more information, contact with our S.T.S or our nearest distributor.

4.3.10.3. Relays interface (option).

- Communication line (COM) is a very low voltage circuit of safety. To preserve the quality, it has to be installed separate from other lines that have dangerous voltages (energy distribution line).
- UPS has a dry contact card for the relays interface communication protocol, it provides digital signals in a free potential way, with a maximum applicable voltage and current of 240 V ac or 30 V dc and 1A.
- This communication port makes possible the dialogue between the equipment and other machines or devices, through the 5 dry contacts supplied in the terminal strip included in the same card and to each one of them an alarm of the 8 available can be assigned (see table 6).

  Also there are other three additional terminals with only one common, for an installation of an external On/Off switch to the UPS and a third one with free setting among EPO, Shutdown or "On-Off" remote control.

  From factory all contacts are normally opened, being able to set them separately one by one, by means of the Hyper Terminal software or equivalent.

- The most common use of this type of ports is to provide the needed information for the closing file software.
- This card has a RS232 port through a RJ connector. So, in case of requiring a DB9 connector, use the adaptor RJ / DB9 supplied with the relays interface card.
- For more information, contact with our S.T.S or our nearest distributor.

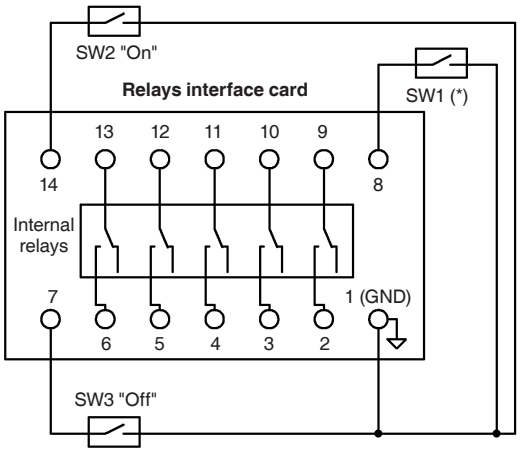


Fig. 18. Relays interface dry contact pin-out.

Installation.

- Remove the protection cover from the slot of the equipment.
- Take the relays interface card and insert it into the smart slot. Make sure that it is well connected, so the resistance that the own connector inside the slot makes has to be overcome.
- Make the needed connections in the alarm terminal strip.
- Put the new protection cover that it is supplied with the relays interface card and fix it through the same screws that fixed the original cover.

Description	Nr pin	Input/output
Mains fault	Programmable	Output
Low battery	Programmable	Output
General alarm	Programmable	Output
Bypass status	Programmable	Output
Summary alarm	Programmable	Output
Battery test	Programmable	Output
Shutdown in process	Programmable	Output
Overload alarm	Programmable	Output
UPS signal "On"	1 (GND) - 14	Input
UPS signal "Off"	1 (GND) - 7	Input
Programmable signal as: - EPO - Shutdown on battery mode - Shutdown on any mode - Remote control "On-Off"	1 (GND) - 8	Input

Tabla 6. Relays interface alarms.

4.3.11. Software.

- **Free software download - WinPower.**
- WinPower is a UPS monitoring software, which makes a user-friendly interface of monitoring and management. This software supplies an auto Shutdown for a system based on several PCs in case of an electrical blackout. With this software, the end-users can monitor and manage any UPS in the same IT network, through the RS232 or USB communication port, never mind the distance between them.
- **Installation procedure:**
  - ❒ Go to website:
    http://support.salicru.com
  - ❒ Choose the operating platform that you need and follow the instructions described in the web site to download the software.
  - ❒ When downloading the needed files from Internet, enter the following licence to install the software:
    511C1-01220-0100-478DF2A .
- When the computer is rebooted, WinPower software will be shown as an icon with plug shape and green colour in the system tray, near the clock.

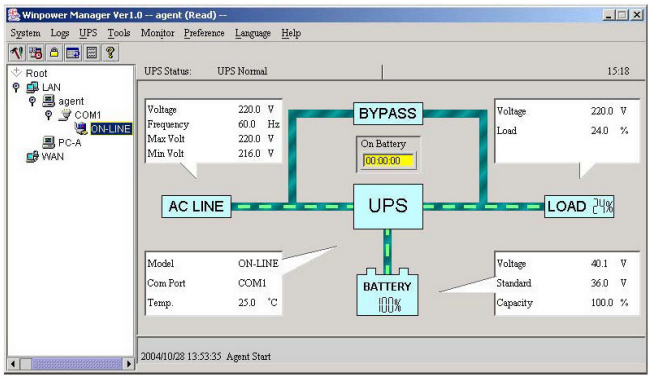


Fig. 19. Main screen of the monitoring software.

4.3.12. Considerations before starting up the connected loads.

- It is recommended to charge the batteries for 2 hours as minimum before using the UPS for first time. When supplying voltage to the equipment, the battery charger will automatically work.
- (B1) equipments with extended back up time has a battery charger with higher quality performances. It is recommended to charge the batteries for 2 hours as minimum before using the UPS for first time.
- Nevertheless, those equipments with extended back up time and with no additional battery charger, it s recommended to charge the batteries of each battery module for 2 hours.
- Although the equipment can work without charging the batteries during the stated time without any problem, the risk of a long blackout has to be valued during the first operating hours and the available autonomy time in the UPS.
- Do not start up the equipment and loads completely till chapter 6 states it.

  Nevertheless, when it is done, it will be done gradually to

avoid any problem, as minimum in the first commissioning.

- If inductive loads with big inrush current apart from sensitive ones are required to be connected like laser printers or CRT monitors, keep in mind the start inrush currents of these peripherals in order to avoid that the equipment becomes blocked under the worst conditions.

  It is better to not connect the loads of this kind, due to the high quantity of energy resources that take from the UPS.

5. Operating.

5.1. Commissioning.

5.1.1. Controls before commissioning.

- Check that the EPO connector with the cable (Fig.A), is inserted into plinth located in the rear side of the equipment.
- Make sure that all the connections have been made properly and are sufficiently tight, respecting the labelling of the equipment and the instructions of chapter 4.
- Check that the UPS is turned Off (shutdown).
- Be sure that all the loads are turned «Off».

  Turn off the connected loads before starting up the UPS , and start up the loads one by one, when the UPS is started up only. Before shutdown the UPS, check all the loads are out of service (Off).
- It is very important to proceed in the established order.
- For UPS view, see figures 1 to 3.
- Figures 16 and 17 shows a manual bypass panel for a parallel system, in a conceptual way (4 to 10kVA models only), valid for a single equipment by adapting the quantity of switches.

5.2. UPS start up and shutdown.

5.2.1. Start up and shutdown of the UPS.

- Check that the power supply connection is correct.
- Press over the start up key ⏻ for more than 3 seconds, the acoustic alarm will beep for 1 sec. and the UPS will start up.
- After a few seconds, the UPS establishes on "Normal mode". If the mains voltage is wrong, the UPS will transfer to "Battery mode", without breaking the feeding at the output power blocks.

  Fan/s depending on the model, will be started up and the LCD panel will show the "SALICRU" brand logo.

  After the initial test of the equipment, it is displayed the main screen.
- Start up the load/s, do not overload the equipment.

5.2.2. Start up of the UPS, without mains.

- Press over the start up key ⏻ for more than 3 seconds, the acoustic alarm will beep for 1 sec. and the UPS will start up.

  Fan/s depending on the model, will be started up and the LCD panel will show the "SALICRU" brand logo.

  After the initial test of the equipment, it is displayed the main screen.
- After a few seconds, the UPS establishes on "Battery mode". If the mains is restored, the UPS will transfer to "Normal mode", without breaking the feeding at the output power blocks.
- Start up the load/s, do not overload the equipment.

5.2.3. UPS shutdown, with mains present.

- Shutdown the load/s.
- Press over the start up key ⏻ for more than 3 seconds to shutdown the inverter. The acoustic alarm will beep for 3 sec. The equipment will be established on "Bypass mode.
- When finishing the previous action, there is still voltage at the UPS output.

  To break the power supply at the UPS output , turn "Off" the circuit breakers of the UPS switchgear panel.

  After a few seconds the LCD screen is shutdown and the equipment will be out of service completely.

5.2.4. UPS shutdown, without mains.

- Shutdown the load/s.
- Press over the start up key ⏻ for more than 3 seconds to shutdown the inverter. The acoustic alarm will beep for 3 sec. The equipment will leave the output power blocks without voltage.

  After a few seconds the LCD screen is shutdown and the equipment will be out of service completely.

5.3. Operative for a parallel system (4 to 10 kVA models only).

- The following operative, it is considered for equipments with the configuration preset from factory.
- Check that the load/s and output circuit breakers switches from protection panel, are in "Off" position.
- Turn "On" the input circuit breaker switches from protection panel.
- In equipments with separate static bypass line, turn "On" the bypass circuit breakers from protection panel.

  UPSs supply output voltage through the bypass. Check the LCD from control panel, in case there was any warning or error information. Check the output voltage at the power blocks of each UPS separately, in order to check the voltage difference is below 1V among them. If the difference is higher than 1 V, double check the wiring and associated instructions.
- Press over the start up key ⏻ for more than 3 seconds, the acoustic alarm will beep for 1 sec. and the UPS will start up. All UPSs will transfer to "Normal model".

  Measure the output voltage on each UPS separately, to check the voltage difference is under 0,5 V. In case the difference were higher than 1 V, the UPSs have to be set (contact with the S.T.S.).
- Press over the start up key ⏻ for more than 3 seconds in any UPS and all of them will be shutdown, at the output will be voltage supplied through the bypass.

  Turn “On” the output circuit breaker switches from the distribution panel and the complete parallel system will supply output voltage through the bypass.
- Press over the start up key ⏻ for more than 3 sec. in any of the UPSs and all of them will start up., finally the parallel system will be working on "Normal mode”
- Start up the load/s.

5.4. How to replace a faulty UPS in a parallel system.

- ❒ Press over the key ⏻ in any UPS for more than 3 seconds to shutdown all the inverters. The acoustic alarm will beep for 3 seconds. The equipments that belong to the current parallel system will transfer to "Bypass mode".
- ❒ Put all the equipments on manual bypass. To do it remove the cover from manual bypass switch, which is located at the back of each equipment and turn all the switches to position "BYPASS".
- ❒ ⚠ Keep in mind that on "Bypass mode" or with the switch on position "BYPASS", the loads will be exposed to fluctuations of voltage, frequency and mains faults or blackouts, so in case it were possible choose one day with the lowest probability of faults (days without fluctuations, days without storms,...) and do it as fast as possible.
- ❒ Turn "Off" the input, output and bypass circuit breaker protections (this last one when it is available) from the protection panel and corresponding to the equipment to replace.
- ❒ Disconnect the communication bus and all power connections, and remove it. In equipments installed as rack, remove the screws that fix it to the cabinet previously.
- ❒ Put the manual bypass switch of the new UPS, to position "BYPASS". To do it remove the protection cover of the manual bypass located in the rear side and act over itself.
- ❒ Put the new equipment that replaces the faulty one and reconnect it. Follow the instructions stated in section 4.3.9.2, to connect them in parallel.

  For equipments installed as rack, put the screws that fix it to the cabinet previously.

- Turn "On" the input and bypass circuit breakers (this last one, if it is available) from protection panel, and corresponding to the new UPS.

  UPSs supply output voltage from bypass. Check the LCD screen from control panel in case there were any warning or error information.

  Measure the output voltage of the new UPS, check the voltage difference is below 1 V. In case the difference were higher than 1 V, double check the wiring and associated instructions.
- Put back the cover of the manual bypass of each UPS.
- Press over the start up key ⏻ for more than 3 sec. in any of the UPSs and all of them will start up. All UPSs will transfer to "Normal mode".

  Measure the output voltage in the power blocks of the parallel system and the output terminals of the new UPS, to check the voltage difference is under 0,5 V. In case the difference were higher than 1 V, the UPSs have to be set (contact with the S.T.S.).
- Press over the shutdown key ⏻ in any UPS for more than 3 seconds and each one will be shutdown, supplying output voltage through the bypass.

  Turn “On” the output circuit breaker switch of the distribution panel, corresponding to the new integrated equipment. The complete parallel system will supply output voltage, through the bypass.
- Remove the cover of the manual bypass in each UPS.
- Transfer the equipments with the manual bypass ("BYPASS" position) to position "UPS". Do it in the switches of all equipments.
- Put back the protection cover of the manual bypass switch of all equipments, also check the torque of the fixing screws, otherwise any of the limit contacts of this cover could be activated and the manual bypass too.
- Press over the start up key ⏻ for more than 3 sec. in any of the UPSs and all of them will start up, finally the parallel system will be working on "Normal mode”.

  Load/s are running and protected by the parallel system again.

5.5. Manual Bypass Switch (maintenance).

5.5.1. Operating principle.

Integrated manual bypass in all UPS from **SLC TWIN RT from 4 to 10kVA** is very useful, but a wrong use can cause irreversible consequences for both the UPS and connected loads at its output. Therefore, it is important to respect the manoeuvring over the switch as it is stated in the following sections.

5.5.2. Transference to maintenance bypass.

- The procedure to transfer from normal mode to maintenance bypass is the same for a single equipment or a parallel system, less the quantity of actions:
  - ❒ For a single equipment.
    - – Press over the key ⏻ of the UPS for more than 3 seconds to shutdown the inverter. The acoustic alarm will beep for 3 seconds. The equipment will transfer to "Bypass mode".
  - ❒ For a parallel system.
    - – Press over the key ⏻ in any UPS for more than 3 seconds to shutdown all the inverters. The acoustic alarm will beep for 3 seconds. The equipments that belong to the current parallel system will transfer to "Bypass mode".
  - ❒ Put all the equipment/s on manual bypass. To do it remove the cover from manual bypass switch, which is located at the back of each equipment and turn all the switch to position "BYPASS.

    In parallel systems, proceed in the same way in each equipment.
  - ❒ ⚠ Keep in mind that on "Bypass mode" or with the switch on "BYPASS" position, the loads will be exposed to fluctuations of voltage, frequency and mains faults or blackouts, so in case it were possible, choose one day with the lowest probability of faults (days without fluctuations, days without storms,...) and do it as fast as possible.

    The UPS still supplies output voltage, from mains directly or through the static bypass line (in those installations that it is available), through the manual bypass of the equipment.
  - ❒ Also, if the protection panel has manual bypass switch, remove the mechanical lock and turn the switch "On" (BYPASS).

    In this case and in this case only, turn the output switch/es from distribution panel to "Off", depending if there is only one UPS or a system of two equipments in parallel.

The UPS is completely shutdown and inactive and loads are supplied through the manual bypass of the distribution panel.

5.5.3. Transference to normal mode.

- The procedure to transfer from maintenance bypass to normal mode, is the same for a single UPS or parallel system, less the quantity of actions to make:
  - ❒ If the protection panel has manual bypass switch:
    - – Turn the output circuit breaker protection/s of the distribution panel to "On" previously, depending if there is a single UPS or a system of two equipments in parallel.

      If the manual bypass switch is manipulated before turning "On" the output switch/es of the protection panel, the power supply to the loads will be break.
    - – Turn the manual bypass switch of the panel to "Off" (UPS) and put the mechanical lock.

      To avoid wrong manoeuvring the mechanical lock has to be fit, otherwise the equipment and loads are exposed to serious damages, even the destruction of both or fire.
  - ❒ Move the manual bypass switch to position "UPS" and put the protection cover the manual switch back.

    Put back the protection cover of the manual bypass switch of all equipments, also check the torque of the fixing screws, otherwise any of the limit contacts of this cover could be activated and the manual bypass too.

    In parallel systems proceed with the same operations in each equipment.
  - ❒ For a single equipment.
    - – Press over the start up key ⏻ for more than 3 seconds, the acoustic alarm will beep for 1 sec. and the UPS will start up.

      Load/s are protected by the equipment again.
  - ❒ For a parallel system.
    - – Press over the start up key ⏻ for more than 3 seconds in any of the UPSs and all of them will start up, finally the parallel system will be on "Normal mode"

      Load/s are protected by the parallel system again.

6. Control panel with LCD.

6.1. Control panel.

Fig. 20. Control panel view.

Button	Function	Description
⏻	Inverter start up	With no AC power supply and battery connected to the equipment (B0 or B1 equipments), press the button for 3 sec. as minimum to start up the inverter.
	UPS start up	When the unit is supplied from the AC input voltage and it is on bypass mode, press the key for more than 3 sec. to start up the inverter.
	UPS shutdown	When the equipment is ON and it has to be shutdown, presss for more than 3 sec. over this key.
◀	Enter into the main menu	When showing the main screen of the UPS by default in the LCD, press over this key for more than 1 sec. to enter into the main menu structure.
	Exit from main menu	Press over this key for more than 1 sec. to escape from the current menu, to the menu by default in the UPS, without executing any command or changing any configuration.
	Move upwards	Press this key for 1 sec. as minimum to move up in the browsing inside a menu.
▶	Move downwards	Press this key for 1 sec. as minimum to move down in the browsing inside a menu.
	Enter into the structure of the next menu	Press this key for 1 sec. as minimum to select the option in the current menu or to enter in the next menu, but without changing any setting.
↵	Select an option of the menu	Press the key for 1 sec. as minimum to select the option in the current menu or to enter in the next menu, but without changing any setting.
	Validate the current setting	Press the key for 1 sec. as minimum to validate the modified option and change the settings.

Tabla 7. Functionality of the buttons or keypad of the control panel.

- The UPS has a control panel with the following parts:
  - ❒ Four buttons or membrane keys, see table 7.
  - ❒ A LCD panel with two colours backlight. By default, the text or graphics messages are shown in white colour over blue background.

When a critical alarm is activated on the UPS, the light of the text or graphic changes to dark orange with orange background (see table 9)

6.1.1. Acoustic alarms.

Alarm condition	Modulation or alarm tone
Active fault	Continuous
Active warning	Beep every second
Output from battery	Beep every 4 seconds. With low battery (end of back up time), one beep every second.
Output from bypass	Beep every 2 seconds

Tabla 8. Acoustic alarms. Condition and modulation or tone.

6.1.2. UPS status and color LCD display, as condition.

Code	Condition	Description	Color LCD
01	State	Bypass abnormal.	Blue
02	State	Utility abnormal.	Blue
03	State	HE abnormal.	Blue
04	Warning	Site wiring fault.	Blue
11	Warning	Battery disconnect.	Blue
12	Warning	Battery low.	Blue
13	Warning	Service battery.	Blue
15	Warning	Charger fail.	Blue
16	Warning	Battery over voltage.	Blue
17	State	ABM state charging.	Blue
18	State	ABM state floating.	Blue
19	State	ABM state resting.	Blue
1A	State	ABM state OFF.	Blue
1B	State	Battery test fail.	Blue
1C	State	Battery test interrupt.	Blue
21	Fault	BUS over voltage.	Red
22	Fault	BUS under voltage.	Red
23	Fault	BUS unbalance.	Red
24	Fault	BUS short.	Red
25	Fault	BUS softstart fail.	Red
31	Fault	Output short circuit.	Red
32	Fault	Inv over voltage.	Red
33	Fault	Inv under voltage.	Red
34	Fault	Inv softstart fail	Red
41	Fault	Output overload.	Red
42	Fault	Inv overload fault.	Red
43	Fault	Bypass overload fault.	Red
51	State	UPS control power On.	Blue
52	State	UPS On from panel.	Blue
53	State	UPS On from COM.	Blue
54	State	UPS auto On	Blue
55	State	UPS Off from panel.	Blue
56	State	UPS Off from COM.	Blue
57	State	UPS auto Off	Blue
62	State	In battery mode.	Blue
63	State	In ECO mode.	Blue

Code	Condition	Description	Color LCD
65	State	In converter mode.	Blue
71	Warning	EPO active.	Blue
72	Warning	On maintain Bypass (only models of 4.. 10 kVA).	Blue
81	Fault	Heatsink over temperature.	Red
82	Warning	Ambient over temperature.	Blue
83	Warning	Ambient NTC abnormal (only models of 0.7.. 3 kVA).	Blue
84	Warning	Fan failure.	Blue
86	Warning	Heatsink over temperature pre-alarm (only models of 0.7.. 3 kVA).	Blue
87	Warning	Heatsink NTC abnormal (only models of 0.7.. 3 kVA).	Blue
94	Warning	Byp relay sticked (only models of 4.. 10 kVA).	Blue
A3	Warning	Fatal EEPROM fault (only models of 4.. 10 kVA).	Blue

Tabla 9. UPS status and color LCD display, as condition.

6.1.3. Main screen.

- UPS control panel provides useful information about the status of the load, events, measures, identification and setting through the screen of the front panel.
- Immediately after the start up, the LCD panel shows the SALICRU logo for few seconds and next the main screen by default is displayed, where the status of the equipment is represented (figure 21).
- When the same menu is displayed for 15 minutes in the LCD, and there has not been any manipulation over the buttons, it will return back to main screen automatically.
- The main screen shows the following information by default
  - ❒ Summary of the status, including the operating mode and load.
  - ❒ Status of the alarm, if there is any one active.

    The alarm includes the fault and warning informations.

  - ❒ Battery and status of the charge, including the battery voltage, charge level and charger status.
  - ❒ Continuous information includes the UPS in parallel and running time.

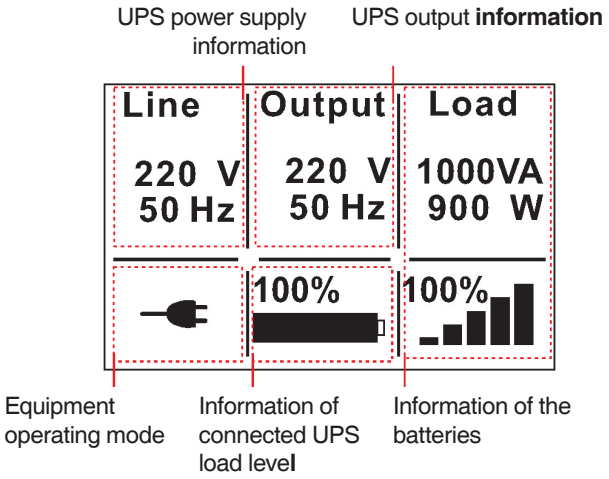


Fig. 21. Main screen of the equipment.

- All the screens shown in the figures of this chapter correspond to a 1kVA equipment, as an example. For more details of LCD screen shoots from control panel, see the next section 6.2.

6.2. Operating modes of the equipment.

- The different graphical symbols displayed in the LCD of the control panel, correspond to the following operating modes or status:
  - ❒ **Normal mode:**

    The UPS is running on normal mode with power supply present.

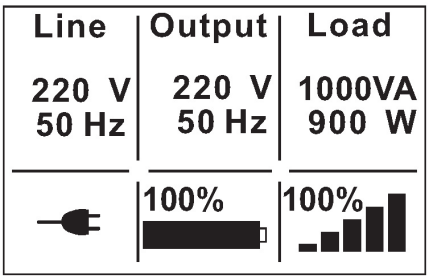


Fig. 22. Normal mode screen.

  - ❒ **Battery mode:**

    When the UPS is running on battery mode, the alarm beeps every 4 seconds.

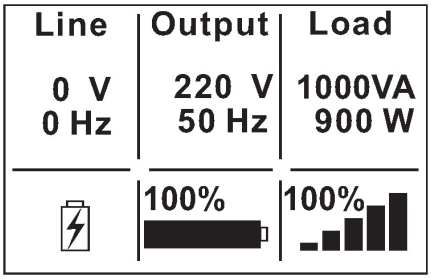


Fig. 23. Battery mode screen.

❒ **Bypass with output voltage:**

The output voltage that feeds the load comes from the commercial mains directly through the internal filters. This way the loads are not protected against mains faults or blackouts. The acoustic alarm beeps every 2 minutes.

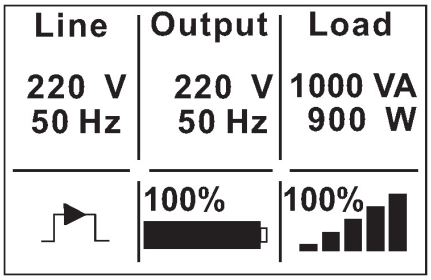


Fig. 24. Bypass with output voltage screen.

❒ **Bypass without output voltage:**

The UPS is running on bypass mode without output voltage.

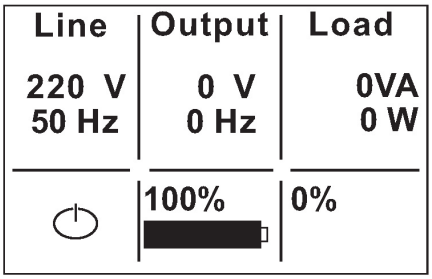


Fig. 25. Bypass without output voltage screen.

❒ **ECO mode:**

Once the UPS is started up, the energy that feeds the load/s comes from the commercial mains directly through the internal filters, meanwhile the voltage is inside the limits that are set as normals.

When input power supply fails, due to fault or wrong, the equipment will transfer from "Line mode" to "Battery mode" to supply the load/s properly.

– This function can be activated through the control panel (by means of password) or through a suitable software (WinPower, ...)

– The transfer time between "ECO mode" and "Battery mode" is around 10 ms. Nevertheless, this time can be excessive for some type of loads, so the ECO mode operating has to be considered according to this issue.

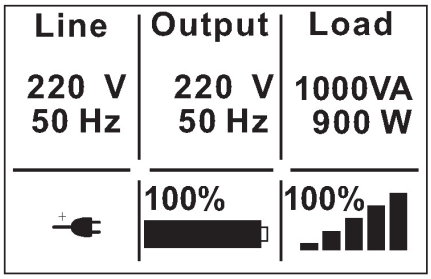


Fig. 26. ECO mode screen.

❒ **Frequency converter mode.**

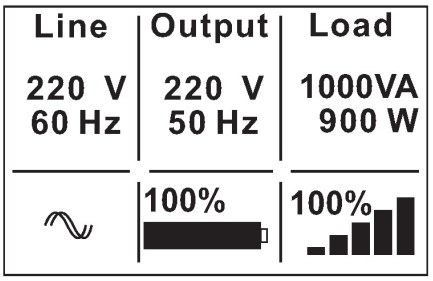


Fig. 27. Frequency converter mode screen.

In the frequency converter mode, the static bypass is disabled and any of the operating modes of itself, because the input and output frequencies of the UPS are different (50 or 60 Hz). When the input power supply fails, due to fault or wrong, the equipment will transfer to "Battery mode" to feed the load/s properly.

– This function can be activated through the settings of the control panel (by means of password) or by means of a suitable software (WinPower, ...)

– The power of the UPS will be the 80% of the nominal, when it is running on "Frequency converter mode".

❒ **Warning.**

When there is a "Warning", it means that there is something wrong in the UPS operating. Usually, the problems are not serious and the equipment can be kept running. However, pay attention to it, because the UPS could fail.

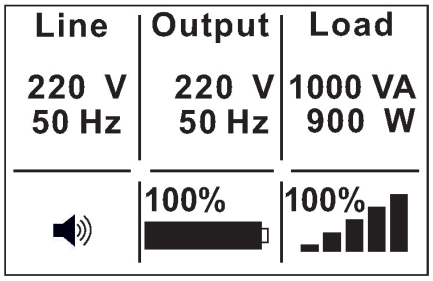


Fig. 28. Warning screen.

❒ **Fault.**

When a fault occurs, it reveals that some serious problems have happened, the UPS will break the output voltage or will transfer to bypass and the alarm will be saved. The screen will change its blue colour to orange as an intuitive warning mode.

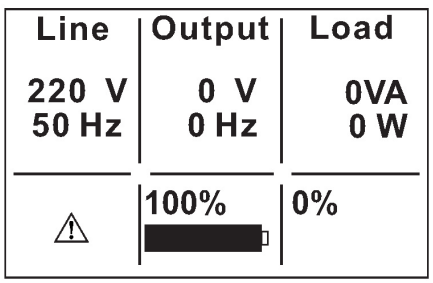


Fig. 29. Fault screen.

❒ **Overload.**

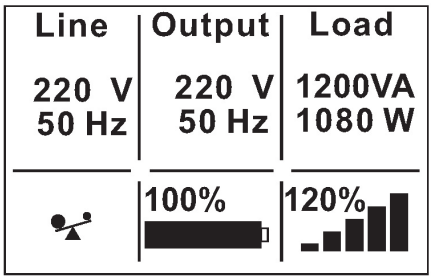


Fig. 30. Overload screen.

When the UPS is overloaded, an alarm is triggered with a beeping of twice per second. Decrease the load level connected at the output of the equipment, till the power doesn't exceed from the nominal power of itself.

❒ **Battery test.**

The UPS is running a battery test.

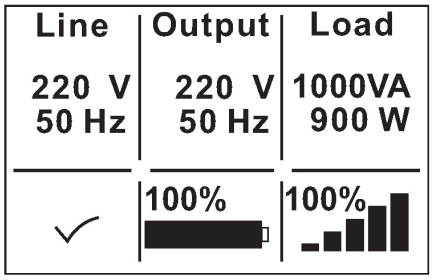


Fig. 31. Battery test screen.

❒ *Battery test screen***.**

When the battery status sensor shows "Faulty battery detected" or "Battery disconnected", the symbol of faulty battery is shown in the screen and the alarm will be saved.

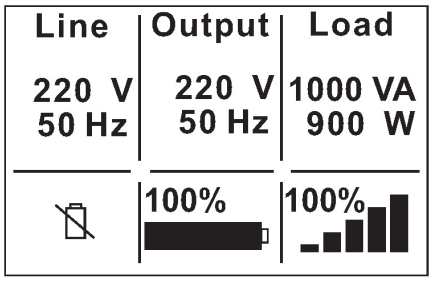


Fig. 32. Faulty battery screen.

6.3. Operating of the LCD panel.

- Less in the main screen, which summarizes the UPS status, the user can get more useful information about the current conditions of the equipment, details of measures, event data logger, the own identification of the UPS, and change the settings to be adapted to the own needs, and optimise the function of the equipment.

6.3.1. Main screen.

- From main screen, when pressing the key ⏶ or ⏷ for less than 1 sec., it is shown detailed information about the alarm, parallel system and batteries.
- From the same main screen, when pressing the key ⏶ for more than 1 sec., the Structure of the main menu will be displayed (see figure 33).

  To display the different submenus, press the keys ⏶ or ⏷ for less than 1 sec., considering that with each pulsation the submenus will be moved to the next or previous depending on the pressed key.

  The Structure of the main menu includes six submenus:

  ❒ UPS status.
  ❒ Event log.
  ❒ Measurement.
  ❒ Control.
  ❒ Identification.
  ❒ Setting. With password only and by the S.T.S.

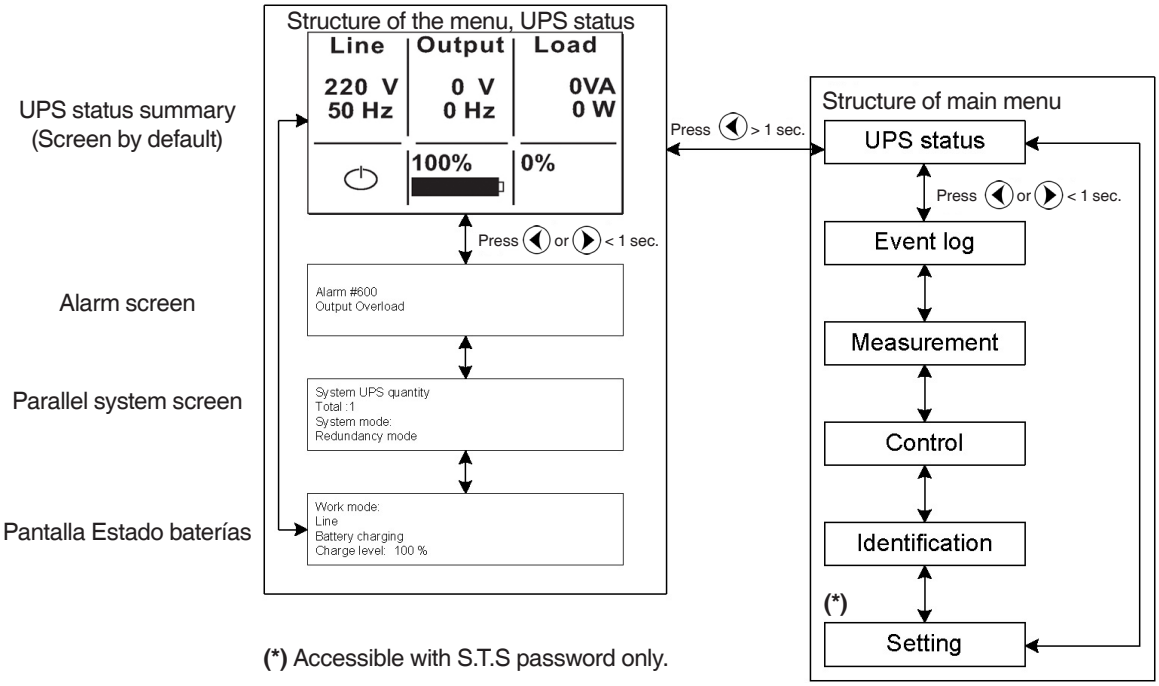


Fig. 33. Main screen structure.

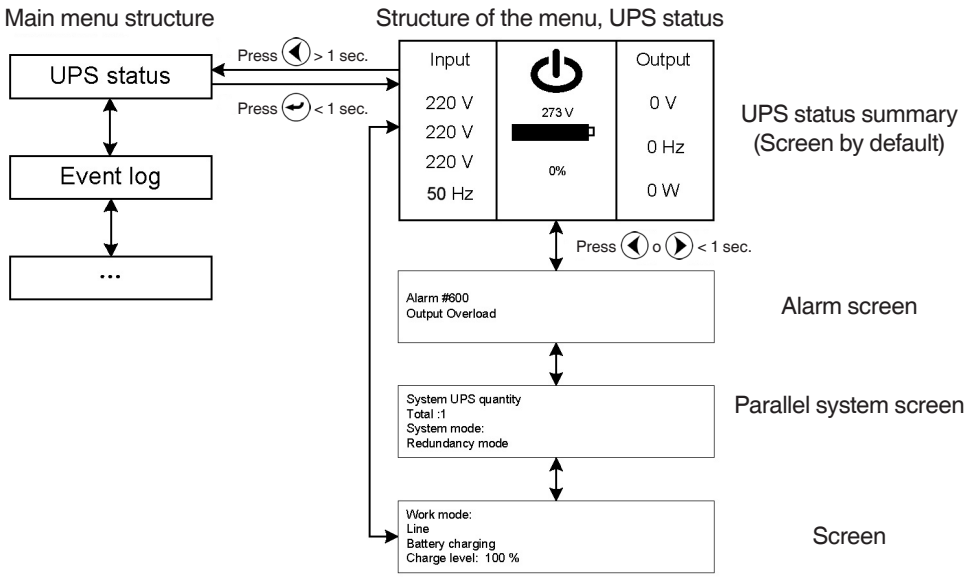


Fig. 34. UPS status screens.

6.3.2. UPS status submenu.

- When pressing the key for less than 1 sec. from the "UPS status" screen, it is returned to main screen.
- The contents of the UPS status menu, is the same as the main screen (see figure 34).
- When pressing the key for more than 1 sec., the LCD will show the "UPS status" screen of the main menu structure again.

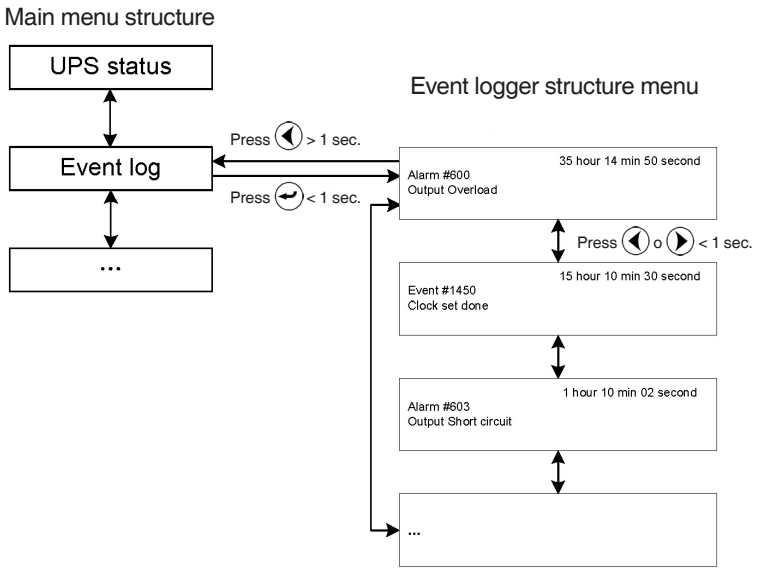


Fig. 35. Event logger submenu screens.

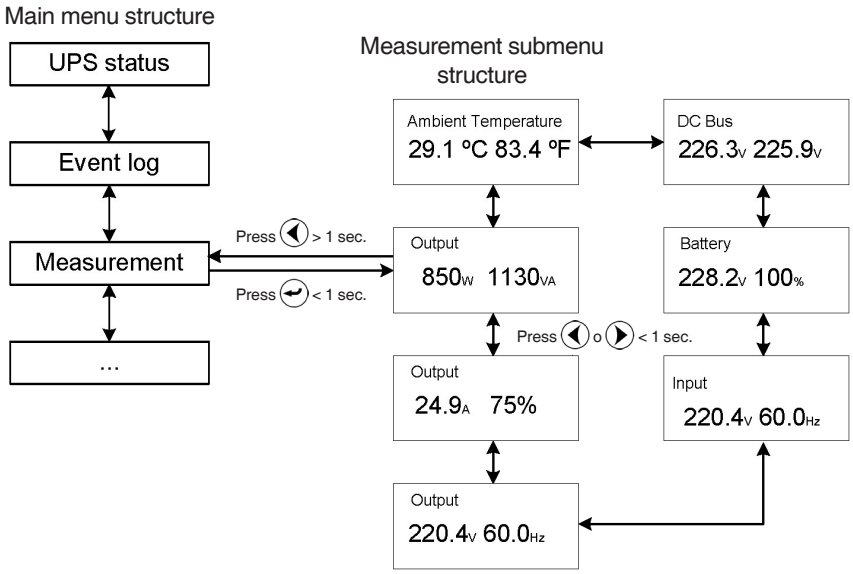


Fig. 36. Measurement submenu screens.

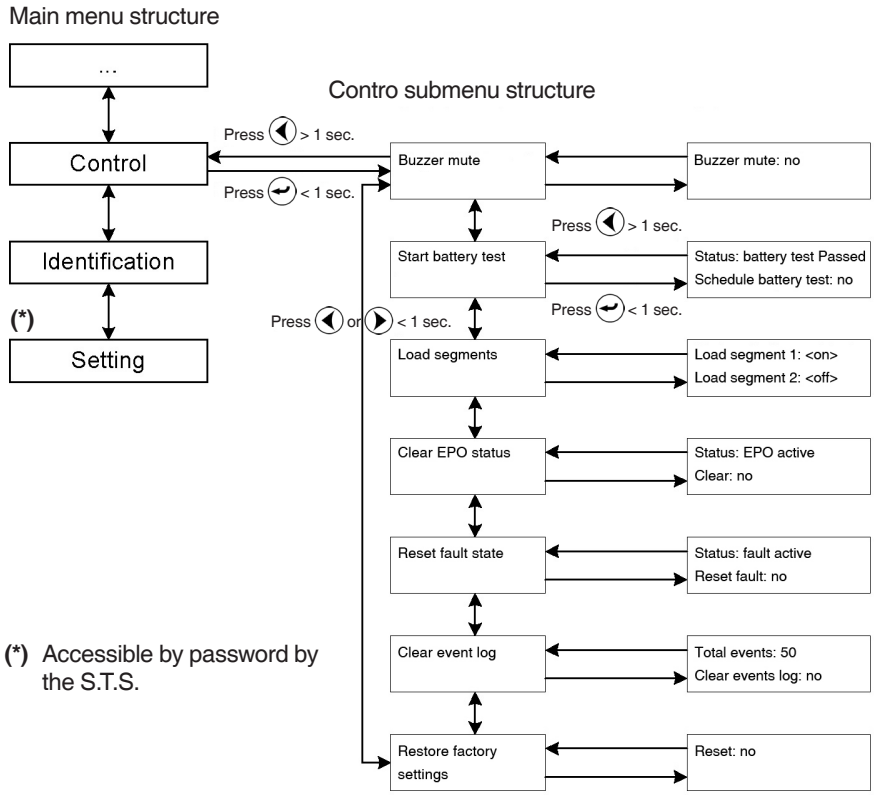
6.3.3. Data logger submenu.

- When pressing the key for less than 1 sec. from the "Event log" screen, it is accessed to the event data logger structure (see figure 35).
- Alarm and faults data logger is registered in this submenu and each one includes the event code, as well as the period of time that the UPS was running under these conditions.
- When pressing the keys or for less than 1 sec. the next and previous events can be checked depending on the pressed key. The system is cyclic so you can move in both directions.

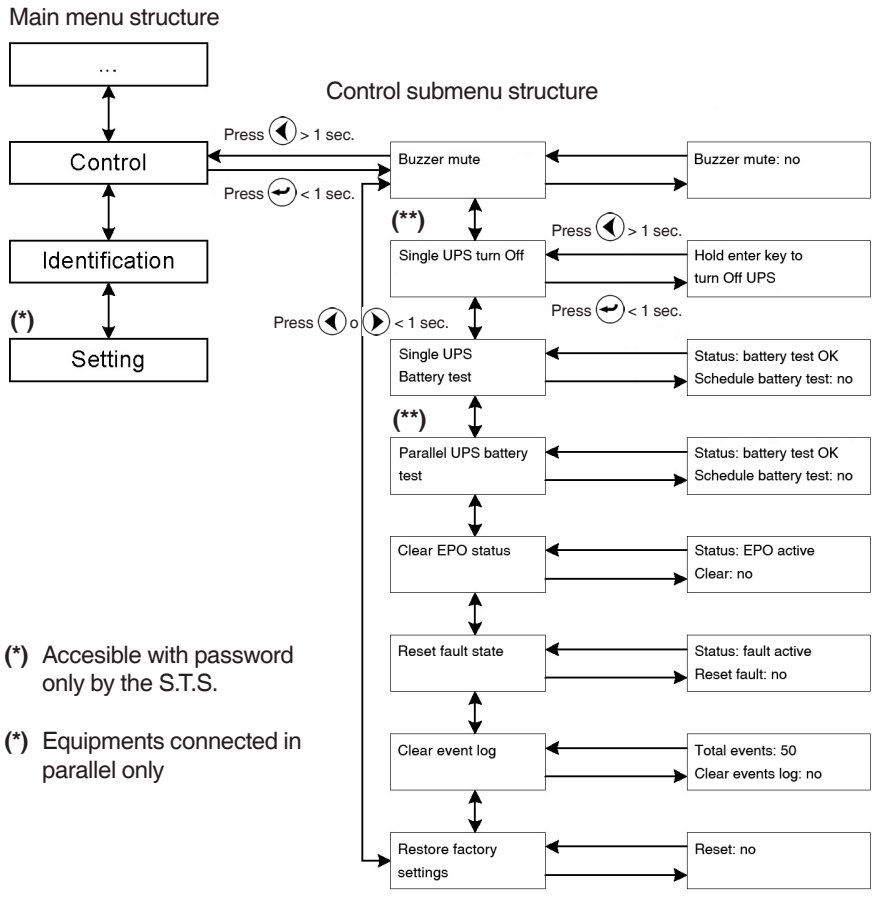
  The maximum quantity of registers of the data logger is 50, so a new input will delete the oldest register.
- When pressing the key for more than 1 sec., the LCD panel will display the screen "Event log" from the main menu structure again.

6.3.4. Measurement submenu.

- When pressing over the key for less than 1 sec. from "Measurement" submenu, it is accessed to the measurements structure (see figure 36).
- From this submenu the following information can be obtained:
  - ❒ Input voltage and frequency.
  - ❒ Output voltage and frequency.
  - ❒ Output current and load level connected in %.
  - ❒ Supplied power at the output in W and VA.
  - ❒ Ambient temperature in centigrade degrees (ºC) and Fahrenheit (ºF).
  - ❒ DC bus voltage.
  - ❒ Battery voltage and battery charge level.
- When pressing the key for more than 1 sec., the LCD will display the "Measurement" screen from main menu structure again.



Control submenu for 0,7 to 3 kVA models.



Control submenu for 4 to 10 kVA models.

Fig. 37. Control submenu screens.

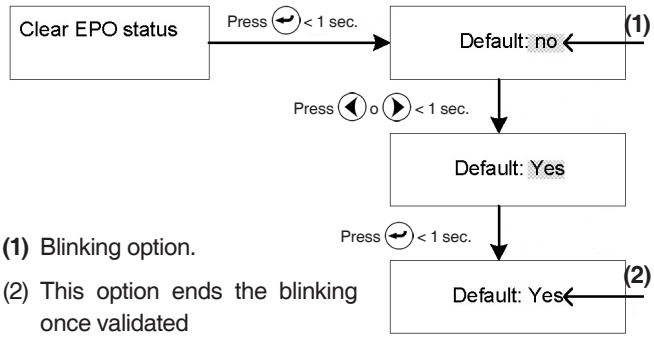
6.3.5. Control submenu.

- When pressing the key the key for less than 1 sec. from this "Control" submenu, it is accessed to the control structure (see figure 37 depending on the power rate of the model).
- The acoustic alarm can be activated or deactivated from this menu. Any new alarm, will activate the own acoustic alarm.
- Battery test: It is a control command of the UPS , to make a battery test of the equipment. It is also possible to do it in the 0,7 to 3kVA units manually (see section 6.1).
- By means of the "Loads segments" menu, the IEC outlets group stated as "LS1" and/or "LS2"can be activated "On" or deactivated "Off", so the UPS will supply or not voltage to the connected loads respectively.

  Also by means of the WinPower software, it is possible to combine other functionality of this menu.
- EPO status cleared: When the EPO button is activated, the UPS output breaks the supply, either if the configuration is single or it is parallel and power supply to load/s is broken.

  To restore the normal condition, the EPO button has to be deactivated previously (close the circuit again) and enter into the "Clear EPO status" submenu to clear the current status of the EPO. Doing this the alarm of the UPS is cleared and the output voltage is restored through the bypass (bypass mode). The equipment recover the start up functionality with its normal procedure. See figure 38 as an example.
- Error status cleared: When there is a fault in the UPS, the fault and alarm mode is activated.

  To restore the normal status, enter into this menu to clear the error status. Doing this the alarm of the UPS is cleared and the output voltage is restored through the bypass (bypass mode). It is needed to check the cause and cancel it before starting up the equipment again with its normal procedure.
- The event log clearance of the last events can be done through this menu. But in lack of this the system logs in the memory the las 50 events.
- Restore the preset configuration from factory: All values are set to the preset values from factory. This action can only be done on bypass mode.
- Shutdown of a single UPS (individual): It is a command to shutdown the UPS that is running in a parallel system currently and other equipment of the system will supply the load/s in the parallel system.



(1) Blinking option.

(2) This option ends the blinking once validated

Fig. 38. Example of screens of EPO status cleared.

- Battery test of a single UPS (individual): It is a control command for a UPS that it is running in a parallel system currently , to make a battery test equipment by equipment.
- Battery test of parallel UPSs: It is a control command of all parallel UPS, to make the battery test in all the equipments that made it up.

6.3.6. Identification submenu.

- When pressing over the key for less than 1 sec. from "Identification" submenu, it is accessed to the identification structure (see figure 39).

  This submenu shows the serial number of the UPS, firmware version and model of the equipment.
- When pressing the key for more than 1 sec., the LCD panel will display the "Identification" screen from the main menu structure again.

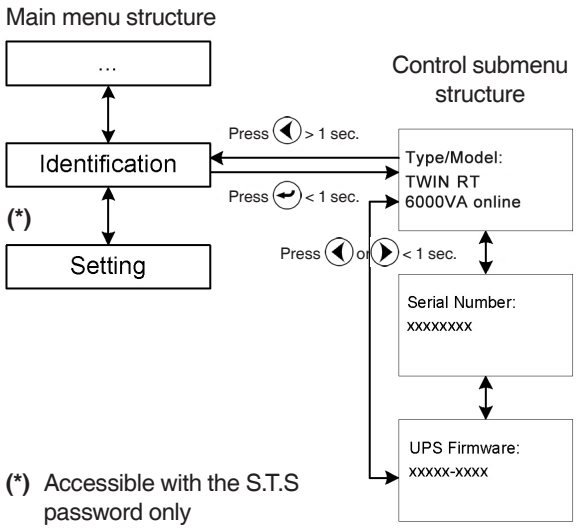


Fig. 39. Identification submenu screens.

- When pressing the key for more than 1 sec., the LCD panel will show the "Identification" screen of the main menu structure again.

6.3.7. Setting submenu.

- This submenu is exclusively reserved for Service and Technical Support or authorised personnel and it is only accessible by password.

  Some settings modify the specifications and settings to activate or deactivate some functions. Wrong modifications and/or settings can make possible faults or lack of protection to the own UPS and even they can affect or damage the load/s, battery or the own equipment directly.
- Almost all the settings can only be done meanwhile the UPS is on bypass mode.

6.4. Special functions

The UPS has some special functions, that could satisfy a special application of the user.

In case you require any of these special functionalists, contact with the S.T.S. to change the standard configuration from factory.

6.4.1. Operating on ECO mode.

6.4.1.1. Short description of the ECO mode.

- "ECO mode" function allows supplying the load/s from mains directly, through the internal filters only, meanwhile the energy is inside the limits, so the UPS allows an "Economy mode" and with high efficiency > 0,97.
- When mains is out of tolerances (voltage and/or frequency), or there are mains failures or blackouts in the power supply, the UPS will transfer to "Normal mode" or "Battery mode" depending on the case and the load/s will be supplied in a safety way.
- Nevertheless, the disadvantages are:
  - ❒ Load can't be protected at 100 %, because on "Line mode" the load/s are supplied from commercial mains directly and through the internal filters of the bypass.
  - ❒ The transfer time of the "ECO mode" to "Battery mode" is 10ms approximately.

  Therefore, this function is not suitable for some sensitive loads or areas with unstable power supply.

6.4.1.2. To establish the ECO mode function.

- The function can be activated or deactivated through the “Setting” submenu (see section 6.3.7).

6.5. Operating as frequency converter.

6.5.1.1. Short description of the frequency converter function.

- In the converter mode, the static bypass is disabled and any of the operating modes of itself, because the input and output frequencies are different (50 or 60 Hz). When input mains fails, either due to a blackout or wrong, the equipment will transfer to “Battery mode” to supply the load/s properly.
- The output frequency is set to the preset value and required by the loads. Nevertheless, the contra is the capacity of the UPS, which is derated up to the 60% of the nominal in the "Converter mode”.

6.5.1.2. To establish the Converter mode function.

- The function can be activated or deactivated through the “Setting” submenu (see section 6.3.7).

7. Maintenance, warranty and service.

7.1. Battery maintenance.

- Pay attention to the safety instructions regarding battery and the stated in section 1.2.3.3.
- The UPSs from **SLC TWIN RT** series only requires a minimum maintenance. The used battery in the standard models is lead acid, sealed, VRLA and maintenance free. These models require a minimum of reparations. The only requirement is to charge the UPS regularly, in order to prolong the battery lifetime. Meanwhile, it is connected to the power supply, never mind if the UPS is ON or OFF, it will keep the batteries charged and will give protection against overcharging and undercharging.
- The UPS has to be charged once, every 4 or 6 months if it has not been used for long time.
- In hot areas, battery has to be charged every 2 months. The charging time has to be 12 hours as minimum.
- Under normal conditions, the battery lifetime is from 3 to 5 years 25º C. In case that the battery was not in good conditions, it has to be replaced before. This replacement has to be done by qualified staff.
- Always replace them with the same quantity and type.
- Do not replace one battery only. All batteries have to be replaced at the same time and following the instructions of the manufacturer.
- Usually, the batteries should be charged and discharged every 4 or 6 months. The charging would be started after a UPS shutdown due to a low battery (discharging). Charging time for standard UPS should be 12 hours as minimum.

7.1.1. Notes for installing and replacing the batteries.

- If it is needed to replace the connection of any wire, purchase original parts through authorised distributors or service centres in order to avoid overheating and sparks with fire risk because the size is not enough.
- Do not short the + and - poles of the batteries, there is risk of fire or electrocution.
- Be sure that there is no voltage before touching the batteries. Battery circuit is not isolated from the input. Hazardous voltages can be found between the battery and earth terminals.
- Although the input and bypass circuit breaker switches (the last one in 4 to 10kVA models with the respective power supply mains) are turned off, the internal parts of the UPS are still connected to the batteries, so there are hazardous voltages inside.

  Therefore, before doing any reparation or maintenance task, the internal battery fuses have to be removed and/or the interlink connections between them and the UPS.
- Batteries have hazardous voltages. The battery maintenance and replacement have to be done by qualified personnel and familiarised with them. Nobody else can manipulate them.

7.2. UPS Trouble Shooting guide.

If the UPS doesn't work properly, check the information given by the LCD of the control panel, according to the models and power of the equipment. Try to solve the problem by means of the established steps in the tables 9 and 10. In case the problem persists, consult with our Service and Technical Support S.T.S..

When it is needed to contact with our Service and Technical Support S.T.S. , provide the following information:

- UPS model and serial number.
- Date when the problem occurred.
- Complete description of the problem, including the information given by the led or LCD panel and the status of the alarms.
- Power supply condition, type of load and the level connected to the UPS, ambient temperature, cooling conditions.
- Information of the batteries (capacity and battery quantity), if the equipment is (B0) or (B1) -with external batteries-.
- Other informations that you may think that they are important.

7.2.1. Troubleshooting guide. Alarm or fault indications.

Alarm or fault		Possible cause	Solution
Code	Description of the LCD panel		
21	Bus Over Voltage	Fault due to positive DC bus overvoltage.	The UPS transfers the load over the inverter (battery mode).
22	Bus Under Voltage	Fault due to positive DC bus undervoltage..	The UPS transfers the load over the inverter (battery mode).
23	Bus Unbalance	Fault in the balancing of positive and negative BUS.	The UPS transfers the load over the inverter (battery mode).
24	Bus Short	BUS voltage decreases very fast.	Consult with the S.T.S.
25	Bus Softstart Fail	Fault of the DC BUS soft start.	Consult with the S.T.S.
31	Output Short Circuit	The UPS detects a wrong output imedance, considering a short-circuit.	The UPS will make a shutdown afger five voltage cycles.
32	Inv Over voltage	Inverter fault due to overvoltage.	The UPS transfers the load over the bypass (bypass mode).
33	Inv Under voltage	Inverter fault due to undervoltage.	The UPS transfers the load over the bypass (bypass mode).
34	Inv Softstart Fail	Fault of the inverter soft start.	Consult with the S.T.S.
41	Output Overload	Output overload.	Check the load and remove the non-critical ones or if any load has failed or it is damaged. The UPS is still working normally, but it can transfer to bypass mode in case the problem persists or the load is increased. When this condition is finished the alarm is cancelled.
42	Inv Overload Fault	The UPS transfers the load over the bypass (bypass mode) due the inverter overload.	Check the load and remove the non-critical ones or if any load has failed or it is damaged. The UPS will transfer the load over the inverter (battery mode), when the load is the shuitable.
43	Byp Overload Fault	The UPS doesn't supply output voltage on bypass or ECO modes, due the overload.	Check the load and remove the non-critical ones or if any load has failed or it is damaged.
81	Heatsink Over Temperature	Heatsink overtemperature inside the equipment is too high.	Check the UPS cooling and ambient temperature of the room.
93	Back Feed (sólo en modelos > 3 kVA)	On battery mode, bypass has voltage.	Transfer to manual bypass and consult with the S.S.T.. Do not touch the power supply terminals of the equipments that are connected to an electrical installation supplied by a UPS. Even, it is dangerous with no power supply, because the equipment is an energy genset.

Tabla 10. Troubleshooting guide. Alarm or fault indications.

7.2.2. Troubleshooting guide. Warning indications.

Warning		Possible cause	Solution
Code	Description in the LCD panel		
02	Utility Abnormal	Input power supply out of range.	Check the AC input mains status.
04	Site Wiring Fault	Neutral faulto to earth detected. The alarm is triggered when there is a a voltage difference between the earth and neutral > 15V.	Reverse the polarity of the input cables 8phase and neutral). By default the detector is activated. It can be deactivated through the control panel with LCD.
11	Battery Disconnect	Low battery voltage. It can be due a blown fuse, wrong connection of the battery module connector or fault in the connection among them, either in the UPS or int he module.	Check the connection of the battery module with the UPS, if any. For any other different incident or if the problem persists, contact with the S.T.S..
12	Battery Low	The UPS works on battery mode and the batteries are depleted (low or very lows).	It is a warning indication, because the remaining back up time depends on the % of connected load. Depending on the load and quantity of external battery module (options), the warning can be activated when there is a 25% of their capacity.
13	Service Battery	Battery block voltage failure detected. The charger has been deactivated as caution measure.	Consult with the S.T.S..
15	Charger Fail	Battery charge failure.	Charger is shutdown till the next charge cycle. Consult with the S.T.S..
16	Battery Over Voltage	Battery overvoltage.	Charger is shutdown till the next charge cycle. Consult with the S.T.S..
71	EPO Active	EPO button open or close, depending ont he selection set in the control pane. Factory preset is open.	Check the status or condition of the EPO button.

Warning		Possible cause	Solution
Code	Description in the LCD panel		
72	On Maintain Bypass (> 3 kVA models only)	Manual bypass switch on BYPASS position and/or the protection cover of the switch is removed.	Check the position of the swith and/or the protection cover is fitted in.
82	Ambient Over temperature	Ambient temperature of the room is high.	Check the cooling of the room and the distance with the environment is as minimum the one stated in section 1.2.3.2..
83	Ambient NTC abnormal (Up to 3 kVA models only)	Ambient temperature of the room is higher than the stated in the specifications.	Check the cooling of the room and the distance with the environment is as minimum the one stated in section 1.2.3.2..
84	Fan Failure	Fan blocking or fault or failure of its power supply.	Check the fans of the UPS.
86	Heatsink Over Temperature pre-alarm (Up to 3 kVA models only)	Temperature inside the equipment is very high , in short the temperature will exceed the UPS limit temperature for blocking it.	Check the UPS cooling, the ambient temperature of the room and the the distance with the environment is as minimum the one stated in section 1.2.3.2. If the UPS transfers to bypass mode, it will come back to its normal operating when the temperature is below of the blocking level. If the problem persists, shutdown the UPS, amke sure that the air flow around the UPS is not restricted and take out any heat source. Leave the equipment cool and re-start it up.
87	Heatsink NTC abnormal (Up to 3 kVA models only)		
94	Byp Relay Sticked (> 3 kVA models only)	Static bypass relay activated.	Consult with the S.T.S..
A3	Fatal EEPROM Fault (> 3 kVA models only)	UPS can't read the EEPROM properly. Internal fault.	Consult with the S.T.S..

Tabla 11. Troubleshooting guide. Warning indications.

7.2.3. Troubleshooting guide. Other circumstances.

Circumstance or condition		Possible cause	Solution
Code	Description in the LCD panel		
01	Bypass Abnormal	Bypass power supply out of range.	Check the status of the AC bypasss.
02	Utility Abnormal	Input power supply out of range.	Check the status of the AC input mains.
03	HE Abnormal	Bypass power supply out of range on ECO mode operating.	Check the status if the AC input mains.
17	ABM State Charging	Battery charger on charge status.	-
18	ABM State Floating	Battery charger on floating status.	-
19	ABM State Resting	Battery charger on rest mode (no operation).	-
1A	ABM State OFF	Battery charger shutdown.	-
1B	Battery Test Fail	Battery test fault	Repeat the process. If the result is the same consult with the S.T.S.
1C	Battery test Interrupt.	Battery test process interrupted.	-
51	UPS Control Power On	UPS control start up.	-
52	UPS On from Panel	UPS start up through the control panel.	Check the status if the AC input mains.
53	UPS On from COM	Start up through the COM port.	-
54	UPS Auto On	Automatic start up.	-
55	UPS Off from Panel	UPS shutdown by the control panel.	-
56	UPS Off from COM	Equipment shutdown through the COM port.	-
57	UPS Auto Off	Automatic shutodwn of the equipment.	-
62	In Battery mode	An AC power supply failure has ocurred and the UPS is on battery mode.	The UPS is supplying energy to the load with the battery energy. Shutdown the load gradually and the equipment too.
63	In ECO mode	The UPS is on bypass when the it works on ECO mode.	The UPS is on bypass as normal mode of operating with high efficiency. The batteru mode is available, so the load protection too.
65	In converter mode	The equipment works as frequency converter.	On this operating mode, the bypass is disabled and the load limit is the 80% of the nominal of the equipment.
A2	Clock Set done	Time setting done.	-

Tabla 12. Troubleshooting guide. Other circumstances or conditions.

7.3. Warranty conditions.

The limited warranty only applies to those products that you acquire for commercial or industrial use in the normal development of your business.

7.3.1. Covered product.

UPS **SLC TWIN RT series**.

7.3.2. Warranty terms.

This product is guaranteed against any parts and/or labour defect for 12 months period from its commissioning by our company staff or other specifically authorised, or 18 months from its factory delivery, whichever expires first. In case of failure of the product inside the warranty period, we must repair, at our facilities at no cost, the faulty part or parts. The transport expenses and packaging will be borne to the user.

We guarantees for period time higher than 10 years, the availability of parts and spare parts, as hardware as software, as well as a complete assistance regarding the reparations, components replacement and software updating.

7.3.3. Out of scope of supply.

Our company is not forced by the warranty if it appreciates that the defect in the product doesn't exist or it was caused by a wrong use, negligence, installation and/or inadequate testing, tentative of repairing or not authorized modification, or any other cause beyond the foreseen use, or by accident, fire, lightnings or other dangers. Neither it will cover, in any case, compensations for damages or injuries.

7.4. Description of the available maintenance and service contracts.

When the warranty is expired, and adapting to the customer's needs, has several maintenance modalities:

Preventive.

It guarantees a higher safety to preserve the correct operating of the equipments with a yearly preventive visit, in which the specialised technicians of our company make several tests and sets in the systems:

- Measurement and write down input currents and voltages among the phases.
- Measurement and write down output currents and voltages among the phases.
- Measurement and write down floating currents and voltages , discharging and charging batteries.
- Checking the logged alarms.
- Checking and testing the measurements of the digital LCD panel:
  - ❒ Input voltages
  - ❒ Input currents
  - ❒ Output voltages
  - ❒ Output currents
  - ❒ Temperatures
  - ❒ Battery voltage and currents..
- Check the battery status.
- Check the fan status.
- Bypass test.
- Make a general cleaning of the equipment.
- Controlling the mechanical parts and temperatures.

This way, it is guaranteed the perfect operating and the possible coming faults are avoided.

These supervisions are usually done without shutdown the equipment. In those cases that a shutdown were needed, date and time would agree with the customer to do the task.

This maintenance modality covers, inside the working timetable, all the journey expenses and manpower.

Corrective.

When a fault occurs in the equipment operating, and previous notice to our Service and Technical Support (S.T.S.), in which a specialized technician will establish the failure scope and he will determine a first diagnostic, the corrective action starts.

The needed visits for its correct resolution are unlimited and they are included inside the maintenance modalities. It means that in case of failure, we will check the equipments as many time as it were needed.

Both preventive and corrective maintenance contracts, is possible to determine the intervention timetable and response times, as well as exclusion or inclusion parts in partial or total way, with the purpose to be adapted to the customer's need.

Consult our Website to have more information.

7.5. Technical service network.

Coverage, both national and international, from our Service and Technical Support (S.T.S.), can be found in our Website.

8. Annexes.

8.1. General technical specifications.

Models:	TWIN RT					TWIN RT (Bornes para dos líneas de AC)				
Available powers (kVA / kW) (**)	**0.7 / 0.63**	**1 / 0.9**	**1.5 / 1.35**	**2 / 1.8**	**3 / 2.7**	**4 / 3.6**	**5 / 4.5**	**6 / 5.4**	**8 / 7.2**	**10 / 9**
Technologya	**On-line double conversion, PFC, double DC bus**									
Rectifier										
Input tipology	Single phase									
Quantity of cables	3 cables - phase R(L) + Neutral (N) and earth									
Nominal voltage	208 / 220 / 230 / 240 V ac									
Input voltage range with 100 % load	176÷276 V ac									
Input voltage range with 50 % load	120÷276 V ac									
Transference voltage range:	Depending on the load percentage between 100 and 50 %									
- Low mains voltage	176 / 110 V ac (±3 %)									
- Low maisn voltage restored	186 / 130 V ac (±3 %)									
- High mains voltage	276 V ac (±3 %)									
- High mains voltage restored	266 V ac (±3 %)									
Frequency	50 / 60 Hz (autosensing)									
Input frequency range	± 10 % (45-55 / 54-66 Hz)									
THDi	< 5 % at full load									
Power factor	> 0.99 (at full load)									
Inverter										
Technology	PWM									
Modulation frequency	19.2 kHz									
Wave shape	Pure sinewave									
Nominal voltage	208 / 220 / 230 / 240 V ac									
Output voltage accuracy	± 1 %									
Voltage THD with linear load	< 2 %									
Voltage THD with non-linear load	< 5 %									
Transient recover time of the output voltage	100 ms. (IEC 62040-3 non-linear load)									
Transient recover time of the output voltage (with load step 0 %-100 %-0 %)	± 9 %									
Transient recover time of output voltage (with load step 20 %-100 %-20 %)	± 6 %									
Frequency	With mains present, synchronised to input nominal frequency (45-55 / 54-66 Hz)									
	Free running -battery mode- 50 / 60 ±0,2 Hz					Free running -battery mode- 50 / 60 ±0,1 Hz				
Slew rate	1 Hz/sec.									
Power factor	0.9 (by default)									
	0,5 to 1									
Permissible load power factor	0.5 to 1 inductive									
Transfer time, inverter to battery	0 ms.									
Transfer time to bypass of mains 2, out of range	-					10 ms.				
Transfer time, inverter to ECO	0 ms.									
Transfer time, ECO to inverter	< 10 ms.									
Efficiency at full load, on line mode with 100% charged battery	> 87 %		> 89 %		> 90 %	> 93 %				
Efficiency at full load, on battery mode	> 83 %				> 86 %	> 89 %			> 90 %	
Efficiency at full load, on ECO mode	> 95 %					> 96 %			> 97 %	
Overload on line mode	102-130 %, 12 sec.					102-130 %, 2 min.				
	130-150 %, 1.5 sec.					130-150 %, 30 sec.				
	> 150 %, 100 ms.									
Overload on battery mode	102-130 %, 12 sec.					102-130 %, 10 sec.				
	> 130-150 %, 1.5 sec.					-				
	> 150 %, 100 ms									
Crest factor	3:1									
Quantity of equipments in parallel	Not available					2 UPSs				
Static bypass										
Type	Common line with mains power supply Hybrid (thyristors in antiparallel + relay)					Separate terminals Hybrid (thyristors in antiparallel + relay)				
Nominal voltage	Mains power supply					208 / 220 / 230 / 240 V				
Nominal frequency	Mains power supply					50 / 60 Hz ±4 Hz				

Models:	TWIN RT					TWIN RT (Bornes para dos líneas de AC)				
Available powers (kVA / kW) (**)	**0.7 / 0.63**	**1 / 0.9**	**1.5 / 1.35**	**2 / 1.8**	**3 / 2.7**	**4 / 3.6**	**5 / 4.5**	**6 / 5.4**	**8 / 7.2**	**10 / 9**
Batteries										
Voltage	12 V DC									
Capacity	7 Ah			9 Ah		5 Ah			9 Ah	
Quantity of batteries in series / String voltage	3 / 36 V DC		4 / 48 V DC		6 / 72 V DC	15 / 180 V DC			20 / 240 V DC	
Low battery voltage, block	11,4 V DC									
Low battery voltage per string	34.2 V DC		45.6 V DC		68.4 V DC	171 V DC			228 V DC	
Blocking voltage due to end of back up time	10,5 V DC element									
Internal battery charger										
Equalising voltage per block	14.4 V DC									
Equalising voltage per string	43.2 V DC		57.6 V DC		86.4 V DC	216 V DC			288 V DC	
Floating voltage per block	13,65 V DC									
Floating voltage per string	41.0 V DC		54.6 V DC		81.9 V DC	204.7 V DC			273 V DC	
Maximum charging current	1,5 A					1 A			2 A	
Recharging time	< 3 horas al 90%									
Earth leakage current	< 100 µA					< 300 µA				
Voltage compensation / temperature	18 mV per block / ºC for temperatures > 25ºC					20 mV per block / ºC for temperatures > 25ºC				
Internal battery charger, option (B1)										
Maximum charging current	6 A					-				
Earch leakage current	< 500 µA					-				
Generals										
IEC inlet connectors	IEC connector 10 A			IEC connector16 A		-				
Input terminals (Phase + Neutral + PE)	-				3 (B1)	3				
Bypass terminals (Phase + Neutral + PE)	-				-	3				
IEC outlets connectors	6 IEC 10A (3 x LS1 + 3 x LS2) + 1 IEC 16 A (3 kVA UPS only)					4 IEC 10A + 2 IEC 16 A			8 IEC 16 A	
Output terminals	-					3 (Phase, neutral and PE)				
Communication ports	2 (RS232 -DB9- and USB, mutually exclusive)									
Monitoring software	WinPower (free download)									
Option cards (to be inserted into the slot)	Relays interface, SNMP, remote internet or intranet management									
Noise level at 1 m.	< 45 dB			< 50 dB		< 55 dB				
Operating temperature	0.. +40 ºC					0.. +45 ºC				
Storage temperature	–15.. +50 ºC									
Storage temperature without batteries	– 20.. +70 ºC									
Operating altitude	< 1000 m a.s.l. (for high altitude correct it according to table 14)									
Relative humidity	0-95 % non-condensing									
Protection degree	IP20									
Dimensions -Depth x Width x Height- (mm): UPS	436 x 438 x 86.5 (2U)				608 x 438 x 86.5 (2U)	560 x 438 x 132 (3u)			560 x 438 x 215.5 (5u)	
Terminals	-					70 x 194 x 118			80 x 416 x 108	
Total dimensions UPS + terminals	-					630 x 438 x 132 (3u)			640 x 438 x 215.5 (5u)	
Battery	436 x 438 x 86.5 (2U)				608 x 438 x 86.5 (2U)	-			-	
UPS weight (kg)	14	15	19	19.5	29	45	47	47	82	83
Battery module weight (kg)	23		28		41	-			-	
Safety	EN-IEC 62040-1; EN-IEC 60950-1									
Electromagnetic compatibility (EMC)	EN-IEC 62040-2									
Marking	CE									
Quality system	ISO 9001 and ISO 140001									

(**) As frequency converter mode, the supplied power is a 80 % of the nominal.

Tabla 13. General technical specifications.

Altitude (m.)	1000	1500	2000	2500	3000	3500	4000	4500	5000
Power	100%	95%	90%	85%	80%	75%	70%	65%	60%

Tabla 14. Correction of power rate as regards to operating altitude.

8.2. Glossary.

- **AC.-** It is nominated as alternating current (abbreviation in Spanish CA and in English AC) to the electrical current in which the magnitude and direction varies in a cyclic way. The most common wave shape of the alternating current is sinewave, because the energy transmission is better. Nevertheless, some applications could need other period wave shapes, like triangular or square.
- **Bypass.-** Manual or automatic, it is the physical junction between the input and the output electric device.
- **DC.-** The direct current (CC in Spanish, DC in English) is the continuous electron flow through a cable between two points with different potential. Unlike the alternating current, in direct current the electrical loads always flow in the same direction from the highest potential point to the lowest one. Although, usually the direct current is identified with the constant current (for example the one supplied by the battery), it is continuous any current that always maintain the polarity.
- **DSP.-** It is the acronym of Digital Signal Processor. A DSP is a system based on a processor or microprocessor that has instructions in it, a hardware and an optimised software to develop applications where numerical operations are needed with very fast speed. Due to this, it is very useful to process analogical signals in real time: in a system that runs in this way (real time) samples are received, usually coming from an analogical/digital converter(ADC).
- **Power factor.-** It is defined as power factor, p.f., of an alternating current circuit, as the ratio between the active power, P, and the apparent power, S, or as the cosines of the angle that make the current and voltage vectors, designating as cos □, being □ the value of that angle.
- **GND.-** The term ground, as its name states, refers to the potential of the earth surface.
- **EMI filter.-** Filter able to decrease the electromagnetic interferences, which is the perturbation that happens in a radio receptor or in any other electrical circuit caused by the electromagnetic radiation coming from an external source. Also it is known as EMI, ElectroMagnetic Interference, Radio Frequency Interference or RFI. This perturbation can derate or limit the efficiency of the circuit.
- **IGBT.-** The Insulated Gate Bipolar Transistor is a semiconductor device that is used as a controlled switch in power electronic circuits. This device has the feature of the gate signal of the effect field transistors with the capacity of high current and low voltage saturation of the bipolar transistor, combining an isolated FET gate for the input and a bipolar transistor as switch in a single device. The triggering circuit of the IGBT is as the MOSFET one, while the driving features are like the BJT.
- **Interface.-** In electronic, telecommunications and hardware, an interface (electronic) is the port (physical circuit) through which are sent or received signals from a system or subsystems toward others.
- **kVA.-** The voltampere is the unit of the apparent power in electrical current. In direct current is almost equal to the real power but in alternating current can defer depending on the power factor.
- **LCD.-** LCD acronym of Liquid Crystal Display, device invented by Jack Janning, who was employee of NCR. It is an electric system of data presentation based on 2 transparent conductor layers and in the middle a special crystal liquid that have the capacity to orientate the light when trespassing.
- **LED.-** LED acronym of Light Emitting Diode, is a semiconductor device (diode) that emits light almost monochrome with a very narrow spectrum, it means, when it is direct polarized and it is crossed by an electric current. The colour, (wave longitude), depends on the semiconductor material used in its construction, being able to vary from the ultraviolet one, going through the visible spectrum light, to the infrared, receiving these last ones the denomination of IRED (Infra Red Emitting Diode).
- **Circuit breaker.-** A circuit breaker or switch, is a device ready to break the electrical current of a circuit when it overcomes the maximum set values.
- **On-Line mode.-** Regarding to an equipment, it is on line when it is connected to the system, and it is in operation, and usually has its power supply turned on.
- **Inverter.-** An inverter, is a circuit used to convert direct current into alternating current. The function of an inverter is to change an input voltage of direct current into a symmetrical output voltage of alternating current, with the required magnitude and frequency by the user or the designer.
- **Rectifier.-** In electronic, a rectifier is the element or circuit that allows to convert the alternating current into direct current. This is done by rectifier diodes, which can be solid state semiconductors, vacuum or gassy valves as the mercury vapour. Depending on the features of the alternating current power supply used, it is classified as single phase, when they are fed by a single phase electrical mains, or three phase when they are fed by the three phases. Depending on the rectification type, they can be half wave, when only one of the current semi-cycles is used, or full wave, where both semicycles are used.
- **Relay.-** The relay(in French relais, relief) is an electromechanical device that works as a switch controlled by an electric circuit where, through an electromagnet, a set of contacts are moved and it allows to open or to close other independent electric circuits.
- **SCR.-** Abbreviation of «Silicon Controlled Rectifier», called commonly as Thyristor: semiconductor device of 4 layer that works as almost an ideal switch.
- **THD.-** They are the acronyms of «Total Harmonic Distortion». The total harmonic distortion is done when the output signal of a system is not equivalent to the one that enter into it. This lack of linearity affects to the wave shape, because the equipment has introduced harmonics that they were not in the input signal. As they are harmonics, it means multiple of the input signal, this distortion is not so dissonant and it is more difficult to detect.

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Product Range

Uninterruptible Power Supply (UPS)
Lighting Flow Dimmer-Stabilizers (ILUEST)
Switch Mode Power Supplies
Static Inverters
Photovoltaic Inverters
Voltage Stabilisers and Power Line Conditioners

Nota: Salicru can give other electronics solutions according to the application specifications or technical specifications.